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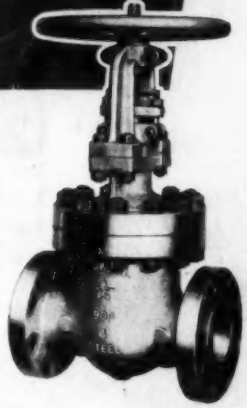

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THE PAPER INDUSTRY

DECEMBER, 1933
Vol. XV—No. 9

A MONTHLY EDUCATIONAL JOURNAL
Devoted to the Interests of the Pulp and Paper Industry

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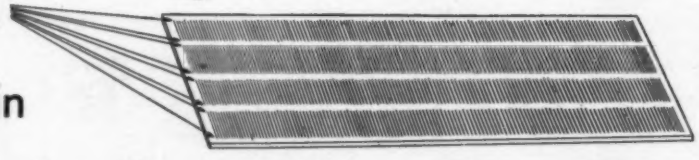

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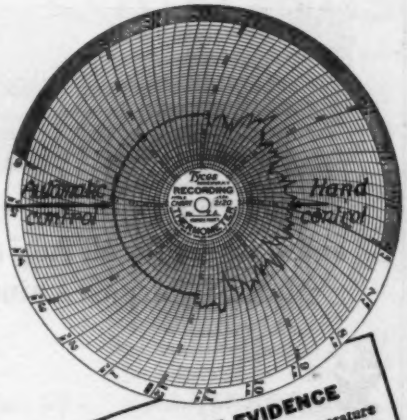

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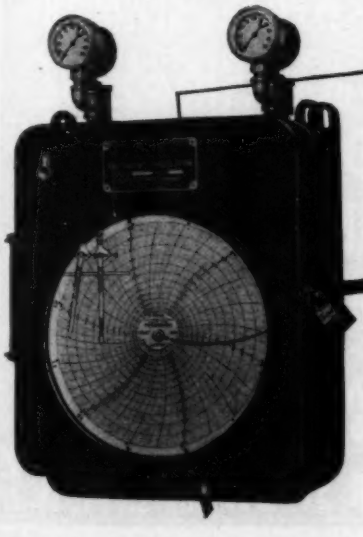
Compare the ragged, uneven temperature line on the right that results from hand control with the smooth, practically perfect line charted under Taylor Automatic Control.



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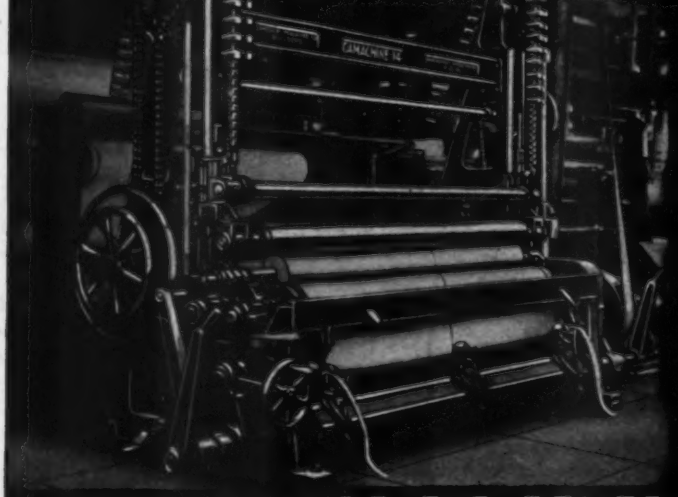

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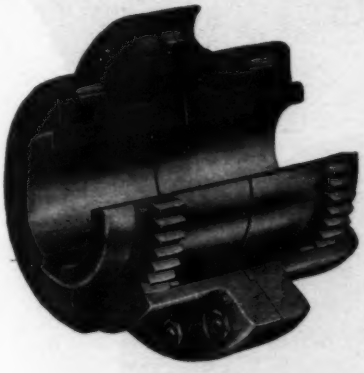

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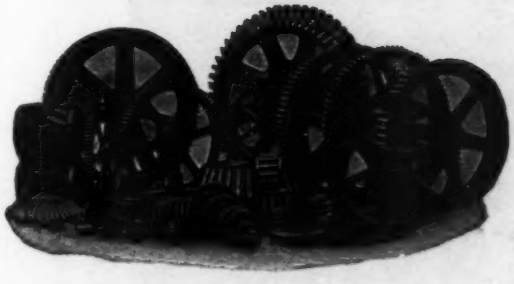

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Will Not Stand For Obsolete Equipment

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IF the "New Deal" means anything, it means that a paper mill cannot continue indefinitely with old, worn out machinery or old methods, with their resultant wastes. « « « « «

The FRITZ REFINING AND HYDRATING MACHINE is the "New Deal" in stock preparation. It will produce a better product uniformly at all times. It will reduce power costs. It requires only a small amount of floor space. It takes the guesswork out of stock preparation whether your raw material is sulphite, sulphate, soda, rope, straw, or old paper. « « « « «

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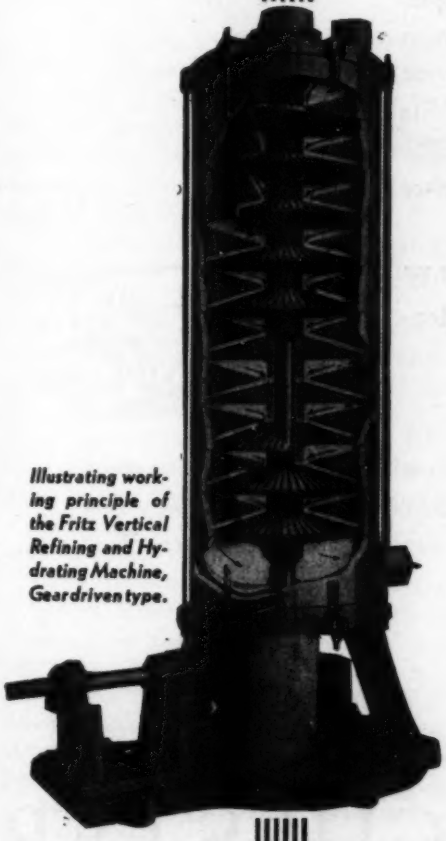

Illustrating working principle of the Fritz Vertical Refining and Hydrating Machine, Gear driven type.

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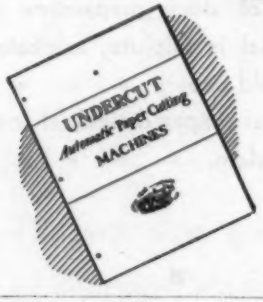
S & W trimmers have the man-made safety devices of other cutters plus the constant safety of the Undercut principle. With Undercuts the knife works from below. It is *always down* away from fingers, hands, arms. Failure of machine or operator and the knife does not *drop*. It will not follow its cutting stroke. In Undercuts alone gravity acts as a constant guard against accidents. It prompts us to ask, "Is any cutter *truly* safe without this feature?"

The safety of the Undercut principle, exclusive with S & W trimmers, is fully explained in the bulletin shown below. Mention T-11 when writing for your copy.



S & W cutting sticks will save your finishing room countless $3.00 or $4.00 grinding jobs. They stop frequent tie-up to replace knives. Bulletin T-11 brings the facts.

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If it's Undercut it's S & W

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Have Faith in Your Leader

THE message of the hour is *have faith in the President.*

We are writing this with the spirit of the national Thanksgiving day still hovering over us. We people of America have much to be thankful for, but the outstanding prayer of Thanksgiving that welled up to heaven from the hearts of a grateful people this past week was thankfulness for the President of these United States.

The outstanding feature of Thanksgiving is the magnificent faith that the President has in the people of these United States.

He came into the picture presenting the most demoralized conditions that this country has ever been confronted with at a time when there was no leadership and at a time when the country was rushing headlong into national bankruptcy. He, alone, with unparalleled courage turned the nation from the brink of an abyss to which it was plunging right about face and on the upward road to constructive rehabilitation.

When the entire history of that momentous period is written, it will give him alone entire credit for this constructive turn at the critical moment of the nation's life. How the country rallied to that matchless leadership is already a matter of history. Statistics will record that they overdid it and that borne along by the enthusiasm growing out of his splendid grasp of the nation's needs, they reversed the trends of the trade and forced the volume of commerce in the United States almost up to the 1930 level in the matter of a few months.

Then happened what always happens when people are rescued from the thralldom of disaster and despair. They began to function normally and in that normal function is found the return to what has been denominated in this country *rugged individualism.* Criticism began to make its appearance. Political enemies and jealous but discarded leaders and divergent schools of economy began to operate again. In the last two months there has operated a ballyhoo of misrepresentation which had for its objective the thwarting of the plan for industrial recovery that the President has evolved for the redemption of its future business. No one else from any other quarter has submitted the hint of a plan to take the place of the NRA which the President has had the supreme courage to put into operation.

Now it might just as well be said right here that the NRA will not be scrapped. Every man in this country who knows anything about the revelations developed during the past six months wherein the unfair business methods and practices were brought to the surface, exposed and checked out, realizes that his future opportunity and the maintenance of his life and activity depend upon the success of the NRA.

In spite of the drive made by the newspapers to discourage the NRA, because through the NRA they must pay more for their newsprint; in spite of the strike by the bankers against giving credit to American industry; in spite of the efforts of the pirates and chiselers who thrived upon misrepresentation, subterfuges and unfair methods to retain the old order of things, the people of the country have in increasing numbers rallied to the call of their leader.

One of the outstanding factors for betterment of American business and stabilization of the same has been the establishment of the United States market for gold. The only wonder is that it hasn't been done before. The United States is a galaxy of forty-eight

sovereign governments between which no tariffs exist and among which interchange of business is an outstanding factor in the world's volume of trade. Gold is the rock bottom basis of commodity exchange. Having gold, one may purchase anything in the world anywhere at any time.

England sitting at the crossroads of the highways of the world's trade and commerce has dominated and controlled the world's values and exchange. Her decision as to the price of gold determined the price of commodities in America. The President of these United States has taken American trade and commerce from under the domination of London bankers and foreign exchange speculators.

The exchange value between the forty-eight states in America is set in America.

In addition to this, we are now free from the effect of any political upheaval in any foreign country. This is a magnificent gain for stabilization. This is a *policy* and not an *expediency*. Like all other policies, it takes time to make it effective.

Of course, England, France and the foreign exchange speculators would hail with delight an announcement by the President of his plans for the control of the American affairs in the world's trade. Just so, would General von Hindenburg have hailed with delight an announcement by General Foch of the plans of the Allied armies.

For two solid months, the President has met this pressure against his plans without criticism or without divulging a scintilla of them.

For this further manifestation of wisdom and courage, we are thankful.

What does this hour and day call for? A manifestation of faith on the part of the people in this country in the wisdom and foresight and courage of their President. No great leader ever attempted to lead the world to higher, better and bigger things who wasn't crucified upon the cross of misrepresentation and detraction and confronted with a barrage of ballyhoo against his methods.

President Roosevelt is running true to the form of a world's beneficent leader. Put your faith in him!

Select Equipment for Profit

MANY purchasers of equipment look upon an individual purchase of machinery as an expense rather than an investment. It is true that in the old days when money flowed freely many things were purchased by the average plant which did not justify the expenditure. Such purchases, of course, were items of expense that could have been easily eliminated. Some of them were probably made just to satisfy the personal whim of someone in the organization with no thought given to an increase in the plant's operating efficiency. Other purchases were no doubt made in an earnest attempt to improve plant conditions and to decrease cost of production. Yet upon installation such equipment might have failed to produce the desired results. In such cases, which must necessarily be in the minority, if a firm is to be successful, the expense would have to be charged to experience. It is an investment only insofar as the experience of the purchaser is concerned.

In the main, however, the purchase of equipment should prove to be an investment rather than an expense. Before making a purchase the need should first be determined; then the purchase made to meet this need. If the need is met satisfactorily, the equipment will make money for the company and will pay for itself and more within a reasonable length of time—an investment rather than an expense.

Keeping Christmas

THE season is again with us when good wishes and Christmas cheer pervade the air; when trivial differences are forgotten; when the petty worries of everyday life are healed by that magic greeting "Merry Christmas." The Paper Industry extends to its readers the Greetings of the Season and best wishes for happiness during the coming year. The thoughts contained in that beautiful expression by the late Henry Van Dyke, entitled "Keeping Christmas," will inspire us all with the real spirit of Christmas.

"Are you willing to stoop down and consider the needs and the desires of little children; to remember the weakness and loneliness of people who are growing old; to stop asking how much your friends love you, and ask yourself if you love them enough; to bear in mind the things that other people have to bear on their hearts; to try to understand what those who live in the same house with you really want, without waiting for them to tell you; to trim your lamp so that it will give more light and less smoke, and to carry it in front so that your shadow will fall behind you; to make a grave for your ugly thoughts and a garden for your kindly feelings, with the gate open—are you willing to do these things even for a day? Then you can keep Christmas. Are you willing to believe that love is the strongest thing in the world—stronger than hate, stronger than death—and that the blessed life which began in Bethlehem over nineteen hundred years ago is the image and brightness of Eternal Love? Then you can keep Christmas. And if you keep it for a day, why not always. But you can never keep it alone."

WHICH ROLL WEARS LONGEST . . . . . *on the Job?*

WHEN you buy paper mill rolls, you are interested primarily in one thing . . . *which roll wears longest on the job?*

Consider the two press rolls in the illustration, shown in the Goodrich factory where they were shipped for recovering. They came from the same mill, were used in the same service. But one of them lasted longer than the other! The one on the left is a modern Goodrich Vulcalock Roll, with its rubber cover worn down to about ¼" of the metal core. The one on the right is an old-fashioned Hard Rubber Base Roll, with its rubber cover worn down to about ½" of the metal core. The original cover on each was ¾" thick. The difference is a quarter of an inch—and represents months or years of wear. The Vulcalock Roll gave that much more service than the Hard Rubber Base Roll. Why?

Because the Vulcalock Roll was covered with soft cushion rubber clear to the core, did not have to depend upon a layer of hard rubber to effect adhesion between soft rubber cushion and metal core. Vulcalock made it possible—a process that is exclusive here at Goodrich, for bonding rubber *directly* to metal, with an adhesion of 700 to 1000 pounds per square inch. The manufacturer of the Hard Rubber Base Roll didn't have Vulcalock, had to use a hard rubber base layer which had no cushioning properties. And the buyer paid the same price for less cushion and less wear in the one case, and for more cushion and more wear in the other. Now what does this mean?

Well it means for one thing that Goodrich Vulcalock Rolls give you an average of 40% more cushion wear. It means longer use between grindings, less maintenance expense, fewer hours of idle time. It means a dollar's worth of cushion for a dollar's worth of rubber roll covering. All these things that can be said in favor of Vulcalock Rolls are equal to saying one and the same thing—the thing in which you are most interested when you buy paper mill rolls—namely, that Vulcalock Rolls last longer and render a better account of themselves in terms of lower unit costs . . . The B. F. Goodrich Rubber Company, Mechanical Rubber Goods Division, Akron, Ohio.

ROLL COVERINGS—BELTING—HOSE—MISCELLANEOUS RUBBER PRODUCTS

Goodrich

ALL *products problems* IN RUBBER

NRA WE DO OUR PART

Vulcalock *Paper Mill Rolls*

Does Steel Point the Way?

By WILLIAM SIBLEY

PRIOR to October, 1929, the steel industry (like all other industries) was under the ban of the anti-trust laws and prohibited from joining hands to protect its several members from bitter, destructive and often vicious rivalry. During that era of good business, administrative conditions were bad, chiefly because of restrictive laws which prevented members of the industry to get together more closely than an occasional ten-dollar-a-plate banquet — and then only in the presence of some corporation attorney.

But if conditions of competition were bad prior to 1929, they were most chaotic after the depression had set in. Price-cutting, which had always been troublesome, became ruinous. The problem of "extras and deductions" opened the way for sharp practices on every side. Underselling was the rule and production costs were seldom considered. Price concessions, credit abuses, waiving of interest, approval of broken contracts, gratuities to purchasing agents, consignment selling, false dates on invoices, and a multitude of other evils ran rife—and piled high the consequent waste.

Under such conditions, it was virtually impossible for progressive members to institute shorter working hours, establish higher wages, or through co-operation with other members inaugurate methods which would lead to betterment of both domestic and foreign business. The galling yoke of restrictive governmental laws was rapidly reducing the steel industry to the status of the railroad industry —a giant rendered impotent and helpless by a multitude of binding laws.

Today, each member of the steel industry reports to a central committee his prices on all products from his basing point — Gary, Birmingham, Pittsburgh, Bethlehem, etc. These base prices are then published for the open inspection of all members. No member shall sell below the minimum published prices for his own basing point, nor shall he sell below the price filed by another member for any other basing point. The penalties for violation in this regard are extremely heavy. And what makes this price fixing system work is the fact that all prices are reported at least ten days before they go into effect.

In a declining market, any company filing a lower price than other members, has the code committee immediately transmit that new low price to all companies making the specified product so that the other companies may file new prices to meet the lowest price when it becomes effective. In an advancing market, the notice of a new lowest price is sent when the last company raises its price and establishes a new minimum. Thus there is always the same price for any product at any given basing point. And thus the fear of being undersold is completely eliminated. All prices are required to fairly consider production costs, with the result that the fatal descending-spiral of below-cost selling has been guillotined.

Further: today in the steel industry employment has increased 21 per cent, wages 22 per cent and the working week has been cut 22 per cent. And all in a period when the rate of operations fell from 53 to 27 per cent of the total ingot capacity, and when prices for steel products rose very little. And still further: the various members of the steel industry who are working together in harmony at the Institute headquarters in the Empire State Building are facing each other with constructive good will— and an almost complete absence of the old time enmity.

These are some of the changes which the adoption of an N R A code has brought about in the steel industry. The code was adopted last August for a period of three months. Recently the industry asked for permission to continue under it for another six months. The acknowledged leaders of the industry sincerely hope for its indefinite continuance.

Are we entering upon a new era of business? Does steel point the way?

With this issue, "Current Thought" celebrates its tenth birthday. It started as a regular feature in the January 1924 number and has appeared without interruption ever since.

During these ten years I have found keen pleasure in being a part of the paper industry; in the associations this contact has brought, and in doing what little I could to help clarify thought along both immediately essential and extraneous lines. If, during this entire decade, I have been of some small benefit to the industry I shall have been amply repaid.

To those that have followed my comments on this page, I wish to extend the Season's Greetings. At the beginning of a new year and another decade, it is the desire of The Paper Industry and myself to make "Current Thought" more interesting and even more valuable to its readers than ever before. Suggested subjects for discussion are always welcome and will be given careful and confidential consideration.—WILLIAM SIBLEY.

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Many other facts about Link-Belt Silent Chain are given in Data Book 125 and Stock List 725. Ask for your copy. These drives are made in sizes from ¼ to 1000 H.P., and over. Drives ½ to 60 H.P. are carried in stock by distributors.

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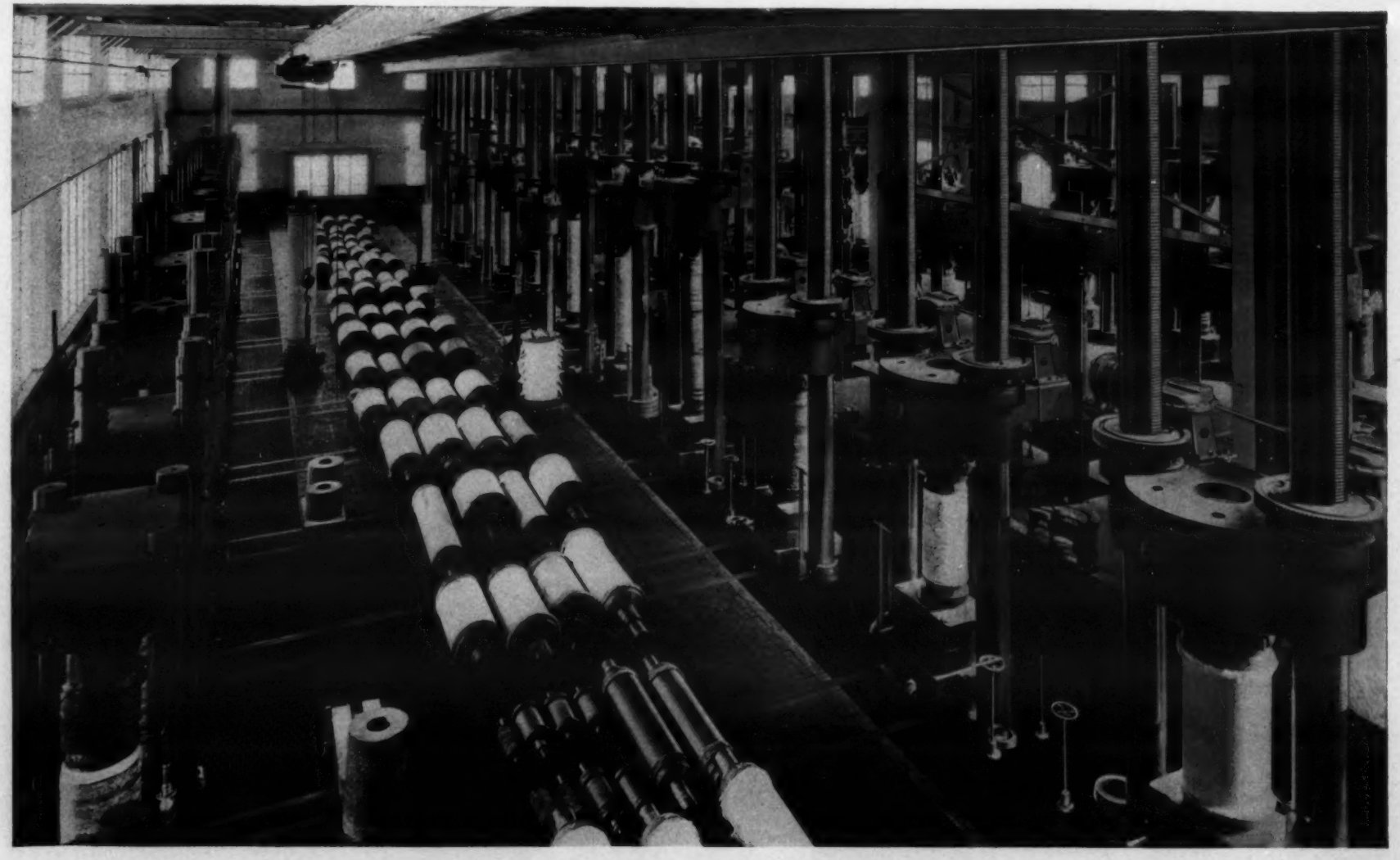

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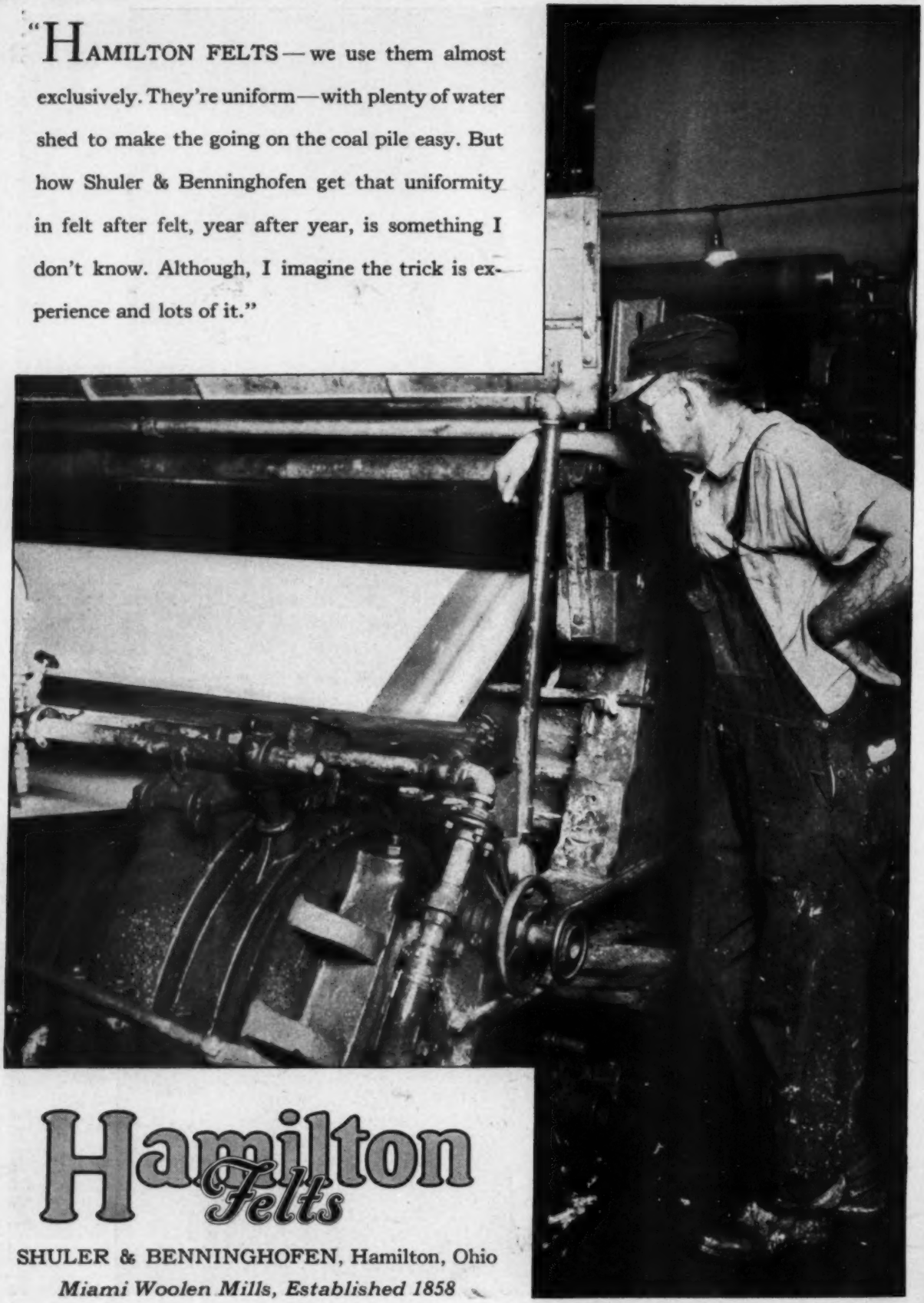

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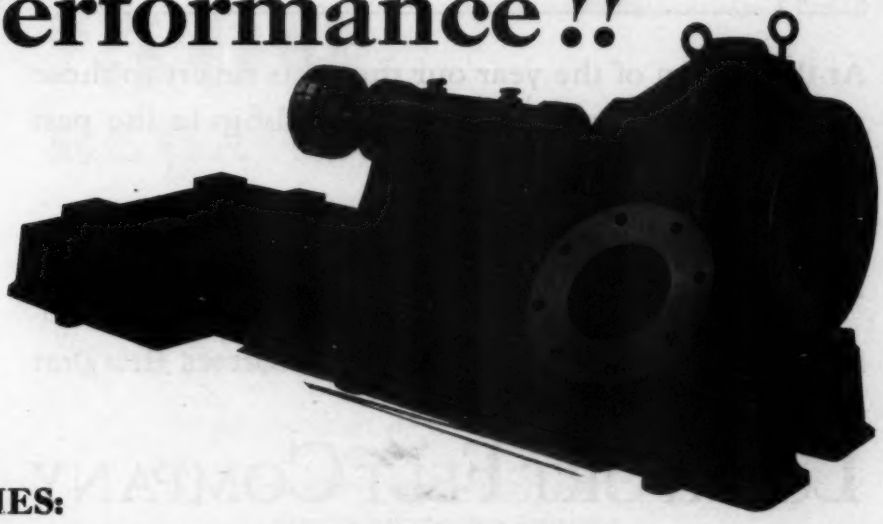

CASE STUDIES:

Mill A. Made comparative tests five years ago on leading makes of paper stock pumps. Up to that time not a single Buffalo pump was installed in that mill. Result of test—so far as we know ONLY Buffalo Paper Stock Pumps have been purchased since.

Mill B. A 10" Buffalo pump replaced another 10" pump on breaker beater service. The Buffalo pump saves about 25 h. p. and has reduced time required to fill the beater from 47 minutes to about 5 minutes.

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Pumps are like automobiles—no matter how nice they look—unless they PERFORM users do not buy another of the same make.

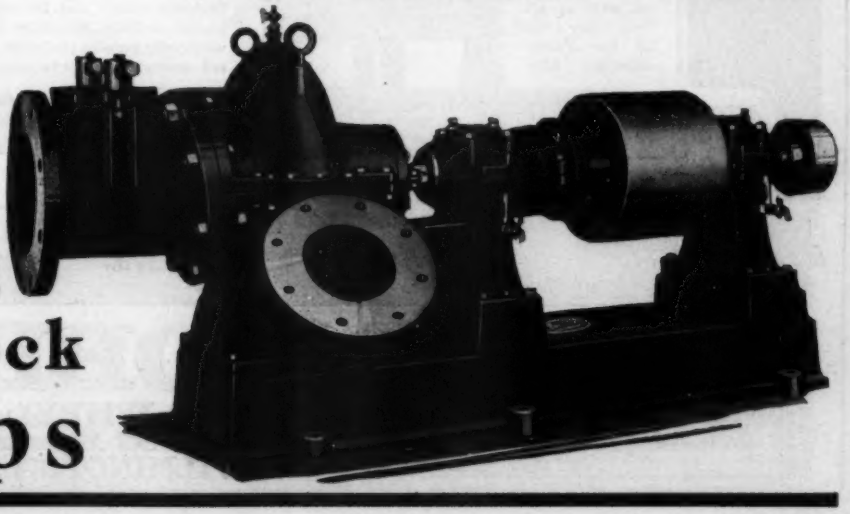
Buffalo Pumps for Paper Stock are PERFORMERS. They have enviable operating records in many mills—on all kinds of stock. Engineering and operating executives like them—and reorder them.

They cost no more than other pumps offered for the same service. Buffalo engineers are ready to make recommendations for your mill. Call on them!

BUFFALO PUMPS, Inc.
213 Mortimer Street, Buffalo, New York
In Canada: **Canada Pumps, Ltd., Kitchener, Ont.**

"Buffalo"

non-clogging paper stock pumps



Season's Greetings

At this season of the year our thoughts revert to those whose co-operation, loyalty and friendship in the past have so materially assisted us.

To You All, the Makers of **TENAX FELTS** extend these greetings:

A Merry Christmas and a Happy and Prosperous New Year

LOCKPORT FELT COMPANY
NEWFANE, NEW YORK

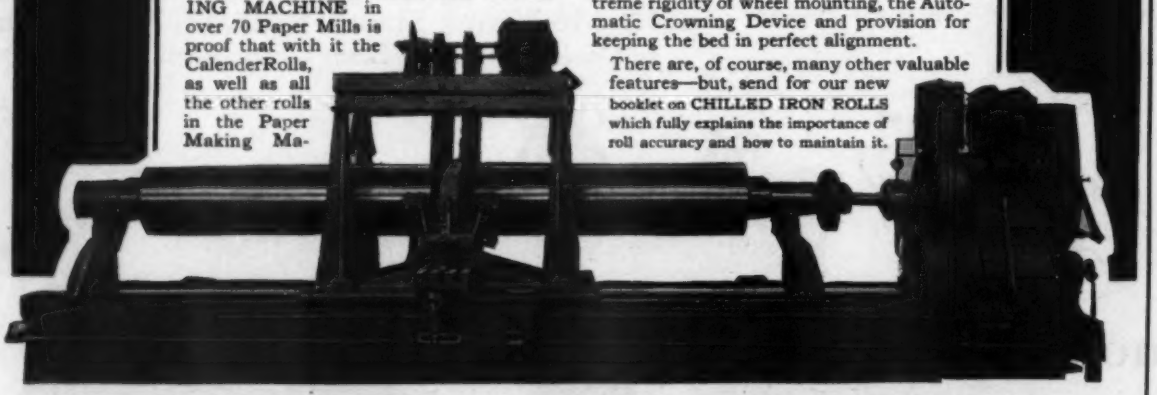
ACCURATE CALENDER ROLLS

—Assure Uniform Quality and Lower Cost

Good paper can't be made with inaccurate Calender Rolls—that's certain.

The use of the LOBDELL ROLL GRINDING MACHINE in over 70 Paper Mills is proof that with it the CalenderRolls, as well as all the other rolls in the Paper Making Machine, may be kept in perfect condition. The accuracy of the LOBDELL GRINDER is due to its exclusive design incorporating extreme rigidity of wheel mounting, the Automatic Crowning Device and provision for keeping the bed in perfect alignment.

There are, of course, many other valuable features—but, send for our new booklet on CHILLED IRON ROLLS which fully explains the importance of roll accuracy and how to maintain it.



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Complete Calender Stacks,—"Puraloy" Chilled Iron Calender Rolls,—Improved Roll Caliper

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$500 REWARD

will be paid to the person supplying me or the local police, with the first information leading to a successful prosecution of any person or firm manufacturing paper outside the Irish Free State, bearing the watermarked words:

"WARRANTED IRISH MADE SWIFT BROOK PAPER MILLS LIMITED"

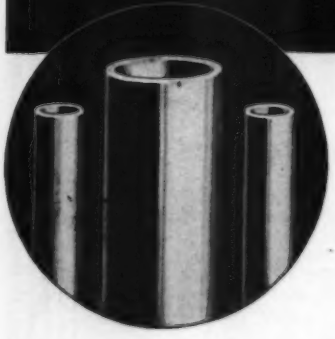
Philip O'Reilly,
Solicitor,
1 Upper Ormond Quay,
Dublin, I. F. S.

Only letters concerning this reward should be sent to the above address

Have you modernized yet?

Profit by these outstanding advantages of National USS 18-8 Stainless Pipe and Tubes for

Pulp and Paper Manufacture



1. Highly resistant to corrosion by sulphite and sulphate pulping liquors, bleaches, and similar paper-making chemicals.
2. Freedom from rust and discoloration.
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4. Seamless—no welds; no uncertainty about full wall-strength in every tube.
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Stainless steels are rapidly achieving a place of the utmost importance in the pulp and paper industry. Begin now to modernize your plant by adopting this superior material for digester relief lines, heater coils, pulp stock lines, bleaching tank piping, and similar services where corrosion of equipment or discoloration of product leads to excessive operating or maintenance costs. NATIONAL engineers and metallurgists will gladly aid in determining the most effective application of the U S S 18-8 alloys to specific service requirements.

U S S Chromium-Nickel Alloy Steels are produced under the licenses of the Chemical Foundation, Inc., New York, and Fried. Krupp A. G. of Germany.

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THE PAPER INDUSTRY

A MONTHLY EDUCATIONAL JOURNAL

Design of Paper-Making Machines

Forty Years Ago . . . and Now

By DESIGNER

FROM the standpoint of an engineer and designer of papermaking machinery, it is interesting to take a look backward and consider the changes in the design and construction of papermaking machines during the past forty years. For some years, the general design of all of the paper machines built in the United States was about the same. This could be attributed to two reasons. One was that due to the comparatively low speeds then in practice (never over 400 feet per minute for a news machine) it was not necessary for the heavy and substantial framing, larger diameter couch and press rolls and larger diameter journals and better types of bearings that later came into common use. The second reason was that the paper mill owners always considered the first cost price of a machine rather than the design or construction. To them, a paper-making machine was simply an aggregation of a wire or cylinder part, two presses and as many dryers as could be placed in a given space, a stack or two of calender rolls, a reel, slitter, winder, a back line drive and a few pumps. They simply considered the number of tons of pig iron required to build such a machine, and the builder who would furnish it at the lowest price. The design, construction and workmanship were of secondary consideration, if considered at all. At that time, an engineer in the employ of the paper company was a rarity. Any engineering work done about the mill was furnished by the millwrights and machinists.

Outside of the cities of Holyoke and Springfield, Mass., very few paper mills had been designed and built by trained and experienced paper mill engineers and architects.

During the late nineties, the mill owners seemed to wake up to the fact that an experienced paper mill engineer could design and supervise the building of a better laid out mill, and one that could be built at less cost that could their local millwrights and builders.

When the paper mill engineers were allowed to make up the paper-machine specifications, in conjunction with the mill superintendent and the machine builders, better papermaking machines were produced. The paper mill owner would be willing to pay for improvements recommended by his own superintendent and supervising mill engineer and architect; but if the machine builder had suggested the same improvements, the mill owner would feel that the builder had an ulterior motive and was simply trying to raise the price of the machine. Now, all of this is changed. Today, the mill engineer and superintendent of the owner consult with the supervising architect and machine builder and decide upon the type of machine best suited for the kind of paper to be made, then settle on the general design and principal details, and the machine builder brings forth a machine that is a credit to him and a source of satisfaction to the owner as to quality and speed of production, minimum of repairs and low cost of clothing and maintenance.

In 1893, a paper machine builder furnished a 120-inch fourdrinier machine to a progressive paper manufacturer in the Fox River Valley. It was one of the widest machines built at that time, and was considered an up-to-date machine in every respect. It was to make newsprint and fine book papers. The newsprint was composed of straw, groundwood pulp and rag stock. The book paper was groundwood and rag stock. This machine consisted of a fourdrinier part having a wire 120 inches wide by 45 feet long.

The breast roll consisted of a steel shaft with cast iron spiders upon it and over which was drawn a bronze casing $\frac{3}{8}$ inch thick by 14 inches diameter. The journals were $2\frac{11}{16}$ inches in diameter by 7 inches long, and were carried in bronze-lined open half bearings. Five of the brass table rolls were 4 inches in diameter, while 36 rolls were 3 inches in diameter. The steel journals were $\frac{3}{4}$ inch in diameter for the 4-inch rolls and $\frac{5}{8}$ inch in diameter for the 3-inch rolls; the journals were all $1\frac{7}{8}$ inches long and were carried in brass open half bearings.

The diameter of the bottom couch roll was 18 inches

and the top roll was 24 inches. Both of these rolls were built on shafts and spiders and covered with bronze jackets. The bearings were bronze-lined of the open half type. The deckle pulleys were 15 inches in diameter and used deckle straps that were 2 inches square. There were three brass suction boxes 2½ inches deep by 5 inches wide inside, and two brass slices each 6½ inches deep.

The pumping equipment included a 5-inch fan pump, a two-cylinder, single-acting, vertical stuff pump, and a three-cylinder, single-acting, vacuum pump, each of which was belt driven. The cylinders of the stuff pump and of the vacuum pump had a 7¾-inch bore with a 10-inch stroke. The vacuum pump was fitted with rubber ball valves.

The two presses had high housings, with worms, screws and hand wheels for raising the top rolls. The top and bottom press rolls, each 18 inches in diameter and built on hollow cored cast iron centers, had ¾-inch rubber covers. The journals were 8 inches in diameter by 10 inches long, and were carried in bronze-lined open half bearings. The press felt rolls were of whitewood and were of 10-inch diameter. The first and second press felts were each 40 feet long.

There was one 28-inch diameter receiving dryer and 17 regular dryers, each 48 inches in diameter and with shells 11/16 inch thick. The dryers had hollow journals that measured 6⅞ inches outside diameter by 10 inches long.

On the driving side of each dryer journal was keyed a cast iron spur gear having cast teeth 1½ inches circular pitch by 3½-inch face. The dryer felt rolls were of 7-inch diameter steel boiler tubes. All wire rolls, press and dryer felt rolls had steel journals 1 7/16 inches in diameter by 4¼ inches long, which were carried on cast iron brackets into which was inserted half bushings of brass pipe. The bearings were open and were packed with a heavy grease, with which the bearings were lubricated. The grease was also supposed to keep out some of the water.

There was one ten-roll stack of calenders. The diameter of the bottom roll was 20 inches, the 8 intermediate rolls 10 inches, and the top roll 16 inches. The rolls were fitted with plain doctors and feeds. In addition, there was a two-drum stack reel, having drums 20 inches in diameter over the wood bars, and a three-shaft compensating winder.

The floor cone pulleys were 36 inches mean diameter by 18-inch face. The pulley hubs were bronze bushed and one end fitted with a friction-clutch lined with wood blocks.

The mortise bevel gears with a 5-inch face and a 2-inch circular pitch run with machine-cut pinions with a gear ratio of 4 to 1. The cones and shafts were mounted on separate cast iron stands which were not tied together.

The machine was driven by a hydraulic turbine, through a line shaft about 140 feet long. The change-sped arrangement of two cone pulleys, each 12 feet long and with four step pulleys, permitted a paper speed range of 99 feet per minute to 217 feet per minute. The pulleys gave 14 changes in speed of about 8½ feet each over the range. The line shaft made 1.175 revolutions to one foot of paper speed at the bottom couch roll.

This machine produced about 1,650 pounds per hour of 40-pound paper, and was purchased for $27,100 f.o.b. the shop of the builder.

After 40 years of service it is still in operation, and is now running about 350 feet per minute. Except for having a 60-foot wire, a suction couch roll and a few additional dryers, the machine is much the same today as when originally built.

One of the problems with which designers had to contend was the amount of power required to drive a paper machine at any given speed. If the machine was driven by a hydraulic turbine, then the power used was all guesswork. A few machines were driven by Corliss engines. In some of these cases, the operating engineer would take indicator cards of a machine at various speeds, and in this way arrive at its approximate power consumption. It was known in many cases that the long line shafting and the floor cone gears required more power to drive than did the rest of the paper machine.

The first electrically driven machines had an electric motor on the end of the line shafts. With this improvement in drive, it was possible to get power readings for each part of the machine. Then, later, came the electric sectional drive, with a motor on each part. Now the power requirements are known very accurately. In fact, the makers of these electric sectional drives have at various times published the results of their power tests, so that the machine designer now has plenty of data to guide him in the selection of proper sized motors for a machine of given width and speed. The excellent article by H. W. Rogers published in the November, 1933, issue of THE PAPER INDUSTRY brings out this point very clearly.

While the modern paper-making machine may seem more complicated than the machine of forty years ago, its operation and ease of handling has been simplified. Through the use of adjustable-lip high slices, the machine tender can regulate the stream flow of the stock coming on the wire without the necessity of putting bricks or other obstructions in the flow-box or back of the slices to deflect the currents to the center or edges. Likewise, much attention has been given to better journal surfaces and to bearings on present day machines. Whether ball or roller or a superior type of ring-oiling bearing is used, all designers agree that water must be kept out of the bearings and the oil must be kept in. Open half bearings packed with grease are no longer in use on new machines. Formerly, rolls were put in standing balance, which was good enough for low speeds. Now all rolls are in running balance, which is necessary for high speeds. The noisy rumbling mortise bevel gears used on the floor-cone drives have given way to worms, spiral bevel or hypoid cut gears running in an oil bath in oil-tight casings, while a better type of high speed or magnetic friction clutches on the floor-cone drives are used.

In recent years, the greatest change has been in the fourdrinier part. High speed shakes, removable fourdrinier or quick change in wire parts and suction-couch rolls, have completely changed the appearance of the web forming part of the machine.

The press parts have been spread out, so that longer press felts are used. One, and sometimes two, suction-press rolls are used. These rolls have given increased life and tonnage to the press-felts and deliver the sheet

to the dryers at a higher percentage of dryness.

A system of air jets passes the paper automatically from the couch to the presses, from the press part to the dryers, from the dryers to the calenders, and then to the reel.

The diameter of the dryers has increased from 28 inches to 3, 4 and 5 feet, as the machines became wider and the speeds higher. A few machines have been built having dryers 6 feet in diameter, but this size is now considered unnecessary for standard machines.

The large diameter spur gears on the dryers have been replaced by cut gears smaller in diameter than the dryers themselves. These gears are wholly enclosed, so that no revolving parts are seen on the driving side except the in-driving shaft. On some machines, sprocket wheels and chains are used instead of spur gears. One great advantage in the use of small diameter gears or sprockets is that the driving side of the dryer part is clear and open and permits the *broke* to be blown out to the back of the machine with an air jet without the danger of catching in the gears, and reduces the necessity of using a *spear* from the front side.

The use of a simple rope carrier passes the sheet automatically through the dryer part, reduces the number of breaks on the dryers, and obviates the danger of passing the sheet by hand at high speeds.

The change in the calender stacks has led to larger diameter of rolls, larger and better type of bearings, heavier housings, electric hoists and better doctors and feeds. The semiautomatic uniform speed reel has superseded the stack or revolving reels.

Large diameter slitter blades are now either driven in a gang by an electric motor, or by a separate motor connected to each bottom slitter. The old single drum winder has been replaced by winders having two drums, and an unloader which automatically removes the finished roll of paper to the floor or to a truck.

Designers of paper-making machines have not been idle the past forty years. There has been a steady improvement in the machine with a corresponding increase in speed and production. These improvements are still going on and will continue. There was a time when a machine that would make a ton of newsprint per hour was considered a great producer. Then several machines of 156 inches and 160 inches in width were built which made 50 tons of newsprint per 24 hours at 550 feet speed. Later, these same machines produced 65 tons at 750 feet speed. There is now one machine which has a daily output of 190 tons of news in 24 hours.

In nearly every case, the older machines could be run at a higher speed, but the bevel gears and pulley rim speeds were the limiting factors. With the coming of the electric motor sectional drives, the speed of machines increased to 1,000, 1,200 and 1,500 feet per minute.

In 1898, ten-pound toilet tissue was made at about 400 feet per minute. Now this same weight and kind of paper is being made at from 800 to 1,000 feet per minute.

Although principal characteristics of a paper-making machine have not changed since the original machine was built over 100 years ago, no one can foretell whether paper will ever be made by a different or more simple process in the years to come. Paper machine designers, however, are moving steadily forward, although they do not know just where their efforts may carry them.

Precision of Measurements

With Pulp and Paper Applications

By D. S. DAVIS

Dale S. Davis' Associates

IN nearly every type of technical work a great deal of time is cheerfully spent in collecting pertinent data while relatively little attention is given to a coldly critical examination of the observations and calculations. This is all the more surprising when one considers the important part which a study of precision measures may play in the interpretation of test results. It is not too much to say that some quantitative indication of reliability should be appended to every vital value and that data in general are incomplete without statements of their uncertainty.

Scope of Precision Studies

An adequate precision treatment, contrary to popular conception, need not be at all involved. For the purposes of test work as carried out in most control and research laboratories in the pulp and paper industry it is usually sufficient to confine precision studies to three fields:

(a) The average and percentage deviations of single observations and the average and percentage deviations of the mean values.

(b) The determination of the precision measure of a calculated value when the precision measures of its components are known.

(c) The determination of the precision necessary in the component values so that a desired degree of precision may be attained in the calculated value.

It is the purpose of this paper to discuss these three items and to illustrate the various types of precision studies with examples chosen from fields familiar to the pulp and paper technical man.

Let us consider the data of Table I which lists check pop tests made on a sheet of 50-lb. kraft.

Table I

	Mullen	Deviation	
	46	0.5	
	47	0.5	
	45	1.5	
	47	0.5	
	50	3.5	
	44	2.5	
Sum	= 279	9.0	= Sum
Mean	= 46.5	1.5	= a. d.

The mean Mullen value is 46.5 and the column headed "Deviation" lists the amount by which each single observation differs from the mean, some of the deviation being positive and others negative. The algebraic sum of the deviations is, of course, zero, but for purposes of computing the average deviation, which is equally likely to be positive or negative, we are interested in the sum of the deviations regardless of their signs. Here, the sum of the deviations is 9.0 and the average deviation, or a. d., of a single observation from the mean is 9.0 / 6 or 1.5. The percentage deviation of a single observation from the mean is given by $\frac{1.5}{47} \times 100$ or 3.2 per cent.

The mean, obviously, is more important than any single observation and it is highly desirable to have a measure of the precision of this average value. It can be shown that, in the long run, the mean of four observations is twice as reliable as any one and that the mean of nine values is three times as reliable as any single value. In general, then, the mean of n observations is $\sqrt{n}$ times as reliable as any one. In the case of the above data, the average deviation of the mean, or A. D., is a. d. / $\sqrt{n}$ or 1.5 / $\sqrt{6}$ or 0.61. The percentage deviation of the mean is $\frac{0.61}{47} \times 100$ or 1.3 per cent.

It frequently happens that one of a set of observations is *wild*, that is, it shows a deviation from the mean considerably in excess of the a. d. of the remaining observations. Should the wild value be retained? The usual procedure is to reject the wild value only when its deviation from the mean of the other values is equal to or greater than 4 times the a. d. of the balance of the data. Thus, if a seventh Mullen test value were found to be 39, one would be justified in discarding it since its deviation from the mean is 46.5 — 39 or 7.5 which is greater than 4 x 1.5 or 6.0.

Best Computation Practice

A brief statement of the simple usages of computation is in order at this point:

(1) Significant figures are those used in denoting physical quantities and not merely in serving to locate a decimal point. They are counted from left to right. Thus, in the value, 0.0014, the 1 and the 4 are the only significant figures. Should an additional place be investigated and found to be zero, as 0.00140, the final zero becomes significant.

(2) In rounding off digits increase the last figure retained by 1 if the discarded digit is 5 or more.

(3) Use but two significant figures in stating average and percentage deviations as was done in the pop-test example.

(4) No more than two uncertain places should be carried in any value. One uncertain place is often sufficient but the use of two will serve to prevent accumulation of error in long calculations. In the above example, one uncertain place is carried in giving the single observations while two are carried in the mean value, 46.5.

(5) In additions and subtractions note the deviations of each item. Rewrite each value so that the last significant figure in each is in the place occupied by the second significant figure in the largest deviation. Thus, if 70.214 ± 0.035, 29.3 ± 1.5, and 1.631 ± 0.085 are to be added note that 1.5 is the largest deviation and that the first place to the right of the decimal point is the last to be retained in each item. Arranged for addition these should appear as

70.2
29.3
1.6
———
101.1

In the sum, *four* significant figures are properly carried, the last being in the tenth's place as in each item.

(6) In multiplication and division note the number of significant figures in that item having the largest *percentage* deviation and retain this number in all the items. Thus, if 40.412 ± 0.025, 383.7 ± 1.5, and 1.532 ± 0.085 are to be multiplied together, note that the last factor has the largest percentage deviation and that four significant figures are properly carried in it. Four, therefore, should be carried in all and the factors are arranged for multiplication as follows: 40.41 x 383.7 x 1.532 — 23,760. Four significant figures should be retained in the product.

(7) In using logarithms, retain as many places in the mantissas (decimal portions) as it is proper to retain in the factors themselves. If 56.385 ± 0.055, 28.41 ± 0.15, and 35.95 ± 0.12 are to be multiplied together through the use of logarithms note that only four significant figures would be retained in each factor according to (6), requiring the use of four-place log tables.

In performing multiplication and division operations, the usual 10-inch slide rule will suffice where only three significant figures are carried; when the data run to four significant figures one should use four-place log tables and when, more rarely, five significant figures are encountered five-place tables are indicated. The C and D-scales of the 20-inch desk-type slide rule approach four-place tables, particularly in their left halves. Close adherence to these common-sense rules of computation is well worth the slight effort and will save time, favor accurate work, and bring one's calculations into conformity with the best engineering usage.

Precision of Calculated Values

When a calculated value depends upon several measured quantities it will be, on the whole, less precise than any single quantity. It is desirable, therefore, to be able to determine the degree of precision of a calculated value when the precision measures of its components are known. Let A be a function of B and C and let $^{\Delta}B$ and $^{\Delta}C$ be the deviations in A which arise from the deviations $^{\delta}B$ and $^{\delta}C$ in B and C, respectively. If A changes twice as rapidly as B, it is clear that the ratio of $^{\Delta}B$ to $^{\delta}B$ is 2, that is, $\frac{^{\Delta}B}{^{\delta}B} = 2$, and in general, $\frac{^{\Delta}B}{^{\delta}B}$ — rate of change of A with respect to B, or

$$\frac{^{\Delta}B}{^{\delta}B} = \frac{\partial A}{\partial B}$$

from which $B = \frac{\partial A}{\partial B}\,{}^{\delta}B$

and similarly, $C = \frac{\partial A}{\partial C}\,{}^{\delta}C$

It can be shown that $^{\Delta}A$, the resultant of the two devia-

tions, $^{\Delta}B$ and $^{\Delta}C$, is given by

$$^{\Delta}A = \sqrt{^{\Delta}B^2 + ^{\Delta}C^2}$$

This will be clarified by a consideration of the following example. The Gephart beater value, V, is equal to one-half the Mullen, M, value plus one-fourth the tear value, T, that is,

$$V = \frac{M}{2} + \frac{T}{4}$$

Given the data, $M = 40 \pm 2.5$
and $T = 200 \pm 10$
what is the average deviation in the beater value?

The deviation in V, $^{\Delta}M$, arising from $^{\delta}M = 2.5$ is given by

$$M = \frac{\partial V}{\partial M}\,{}^{\delta}M = \frac{2.5}{2} = 1.3$$

while $^{\Delta}T$, the deviation in V arising from $^{\delta}T = 10$ is given by

$$T = \frac{\partial V}{\partial T}\,{}^{\delta}T = \frac{10}{4} = 2.5$$

The resultant deviation in V, or $^{\Delta}V$, is then,

$$^{\Delta}V = \sqrt{^{\Delta}M^2 + {}^{\Delta}T^2} = \sqrt{(1.3)^2 + (2.5)^2} = 2.8$$

As a second example, consider the estimation of uncertainty in weir flow values due to errors in measuring the width of weir and in reading the head. For a rectangular, uncontracted weir the familiar Francis formula is

$$Q = 3\,B\,H^{3/2}$$

where Q is the rate of flow in gallons per minute when B is the width of weir and H is the head, both in inches. Let B be 20″ with an a. d. of 0.5″ and let H be 3.5″ with an a. d. of 0.10″. Then $^{\delta}B = 0.5$ and $^{\delta}H = 0.10$

while $^{\Delta}B = \frac{\partial Q}{\partial B}\,{}^{\delta}B = 3\,H^{3/2}\,{}^{\delta}B =$

$3\,(3.5)^{3/2}\,(0.50) = 9.8$ and $^{\Delta}H = \frac{\partial Q}{\partial H}\,{}^{\delta}H =$

$$\frac{3\,(3)\,B\,H^{\frac{1}{2}}}{2} = \frac{3\,(3)\,20\,(3.5)^{\frac{1}{2}}\,(0.10)}{2} = 17.$$

$^{\Delta}Q$ is given by $^{\Delta}Q = \sqrt{^{\Delta}B^2 + {}^{\Delta}H^2}$

which, on substitution, becomes,

$$^{\Delta}Q = \sqrt{(9.8)^2 + (17)^2} = 20$$

from which it is seen that an error of half an inch in measuring the width of the weir and an error of a tenth of an inch in reading the head will cause, in the long run, an uncertainty of 20 gallons per minute in the rate of flow. If both errors are in the same direction the error in the rate of flow is 9.8 + 17 or 27 gallons per minute and if they are in opposite directions the final error may be as low as 7 gallons per minute. If, however, the errors are equally likely to be positive or negative the resultant error is 20 gallons per minute.

Where the calculated value is a straight multiplication function (with or without the occurrence of powers), as in the weir flow example, rather than an addition function, as in the beater value example, a somewhat simpler procedure may be employed. This can be designated as the percentage method since it deals with percentage deviations and its use avoids all differentiation. Thus, the percentage error in B is $\frac{^{\delta}B}{B} \times 100$ or $\frac{0.50}{20} \times 100$ or 2.5%, and the percentage error in H is $\frac{^{\delta}H}{H} \times 100$ or $\frac{0.10}{3.5} \times 100$ or 2.9%. The error in B contributes a percentage deviation of 2.5 toward the resultant error and the error in H contributes a deviation of $\frac{3}{2} \times 2.9$ or 4.4% toward the resultant error, the coefficient, 3/2, corresponding to the exponent of H. The resultant percentage error in Q is the square root of the sums of the squares of the component errors or $\sqrt{(2.5)^2 + (4.4)^2}$ or 5.1%. The value of Q is 3 (20) $(3.5)^{3/2} = 390$ and 5.1% of this value is 20 gallons per minute, which is in agreement with the uncertainty obtained by means of the longer method.

Precision of Component Values

The purpose for which any test work is undertaken usually decides the degree of precision necessary in the final calculated result. Before any observations are attempted it is essential to determine how closely each shall be made. This is not a question of independent decision for without a systematic means of handling the matter it is usually found in the end that some measurements have been made more precisely than is necessary and that others have not been made carefully enough.

Returning to the general case where A is a function of B and C and where $^{\Delta}A = \sqrt{^{\Delta}B^2 + {}^{\Delta}C^2}$ it is clear that, in theory, an infinite number of combinations of values for the component deviations, $^{\Delta}B$ and $^{\Delta}C$, can result in the same final deviation, $^{\Delta}A$. Not all of these combinations would be practicable, of course, and it is usual, and nearly always sufficient, to distribute the component deviations so that the errors, $^{\delta}B$ and $^{\delta}C$, in B and C, respectively, affect the final result equally. That is, $^{\Delta}B$ is taken equal to $^{\Delta}C$, so that $^{\Delta}A = \sqrt{2\,{}^{\Delta}B^2} = \sqrt{2}\,{}^{\Delta}B$, or for n components in place of but two, $^{\Delta}A = \sqrt{n}\,{}^{\Delta}B$.

As an illustration, consider the calculation of the cuprammonium disperse viscosity of a pulp according to the T. A. P. P. I. Officail Standard Procedure, T-206-m, which states that the viscosity, V, in centipoises, the time of flow, t, in seconds, and the tube constant, C, are related by the expression

$$V = 0.96\,\frac{t}{C}$$

If the tube constant has been found to be around 11 and if previous experience has shown the time of flow to be about 720 seconds, how closely must each value be determined so that the calculated viscosity shall not be in error by more than 1.5 centipoises? On substituting in the equation it is seen that V is given by $0.96\,\frac{720}{11}$ or 63 and that the maximum percentage error in V shall be $\frac{1.5}{63} \times 100$ or 2.4%. Assuming that the errors in t and C shall affect the resultant error equally it is clear that each of these errors must be equal to the resultant error divided by $\sqrt{2}$, or $2.4/\sqrt{2}$ or 1.7%. An error of 1.7% in the time amounts to $\frac{1.7}{100} \times 720$ or 12 seconds while an error of 1.7% in the tube constant is equivalent to $\frac{1.7}{100} \times 11$ or 0.19. Thus it is seen that the distribution of error is a reasonable one in that it is easily possible to measure the time to 12 seconds and to determine the tube constant to 0.2.

The calculation of paper machine production according to the formula,

$$P = \frac{w\,O\,B\,v}{1{,}152{,}000}$$

will serve as a second example. Here P is the production in tons of a machine w inches wide operating for

O hours at v feet per minute on kraft of a basis weight of B pounds, 24″ × 36″, 480.

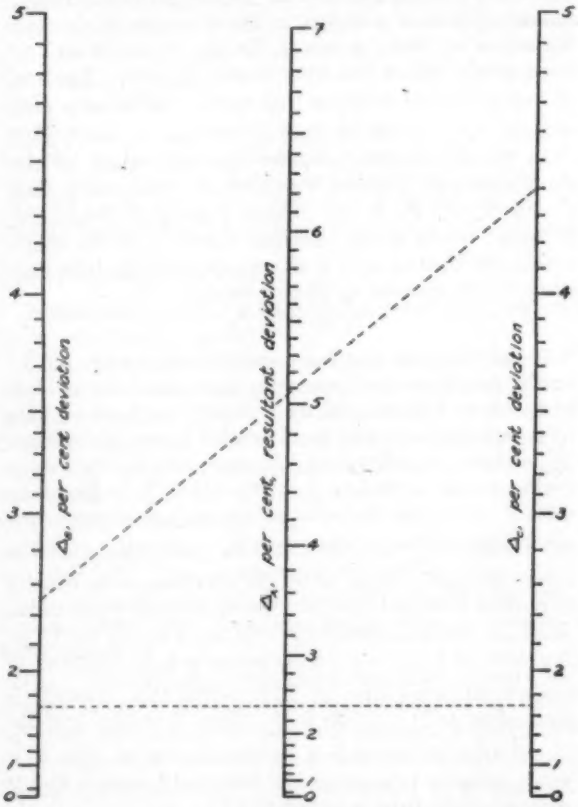
How closely shall each variable be measured so that P is good to 3 tons when the trim is 180 inches, the operating time is 23 hours, the basis weight is 50 pounds and the machine speed is 600 feet per minute? Substituting in the equation,

$$P = \frac{180 \times 23 \times 50 \times 600}{1{,}152{,}000} = 108$$

and the percentage error in P is not to exceed $\frac{3}{108} \times 100$ or 2.8%. The trim is capable of being measured so accurately that it may be considered as without error, reducing the number of variables from four to three. Assuming equal effects, the errors in time, basis weight, and speed shall each amount to but $1/\sqrt{3}$ times the resultant error of 2.8% or 1.6%. Errors of 1.6% in time, basis weight, and speed are 22 minutes, 0.80 pounds, and 9.6 feet per minute, respectively, and as each is not unreasonably small it appears that the assumption of equal-effect errors is justified.

Resultant Deviation Nomograph

The accompanying alignment chart facilitates computation of the resultant error when the component errors are known and also enables rapid determination of the component errors when the resultant error is



known, assuming equal effects. The use of the chart is illustrated as follows: Returning to the percentage method of the determination of the uncertainty in weir flow we note that a deviation of 2.5% arises from measurement of the width of the weir and that a deviation of 4.4% is contributed by error in reading the head. Connect 2.5 on the $^{\Delta}$B-scale with 4.4 on the $^{\Delta}$C-scale (see upper broken line) and read the resultant deviation as 5.1% on the $^{\Delta}$A-scale.

In the example dealing with the calculation of cuprammonium viscosity it was found that the errors in the determinations of the time and tube constant were to be equal and that their resultant was to be 2.4%. Draw a line perpendicular to the $^{\Delta}$A-scale at the 2.4 point and note that it meets both outer scales at the value 1.7% as shown by the lower broken line.

Component errors numbering more than two can be handled in a step-wise fashion as follows: The component deviations are 2, 3, and 4%; what is their resultant? Connect 2 on one outer scale with 3 on the other and note the intersection with the central scale as 3.6. Then connect 3.6 on one outer scale with 4 on the other and read the desired resultant as 5.4% on the central scale.

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Small Losses Increase Operating Costs

INDIVIDUALLY small losses here and there have a way of growing rapidly into big losses. Each loss, though expressed as a percentage, may mean relatively little at first sight; but when analyzed, the final costs or wastes may be very large.

For example, for each per cent of slippage of a belt, a loss of 1 per cent of the power transmitted occurs. If the total cost of power transmitted by belt drives is equivalent to $3,000 a year and an average slip of 3 per cent occurs, the loss is $90; if 5 per cent, the annual loss is $150. By spending a little money on belt dressing or replacing an old belt with a new one when necessary or employing a wider belt, this loss can usually be practically eliminated at nominal cost.

By covering the furnace brickwork or wall with a high-grade furnace plastic it is possible to reduce the air leakage or air infiltration to such an extent that fuel consumption will be cut 3 per cent to 15 per cent. It costs only about the equivalent of one shovelful of coal to cover one square foot of brickwork. Yet coated furnace walls are the exception rather than the rule.

Many engineers water, wet down, or temper the coal before firing it, since the coal seems to burn better. There is a smaller loss of unburned carbon in the ashpit, less fine coal is sent up the stack with a draft, fires require cleaning less frequently and the efficiency seems to be higher. But for every size of coal and type of coal there is a given percentage of water which can be added to advantage, above which the water not only represents a distinct waste of water, but an added loss for evaporating it.

The closer the temperature of the feedwater returning to the boiler is to the temperature of the water in the boiler, the less heat is required to reheat the water. Therefore, fuel is saved by sending the returns back to the boiler quickly, by covering pipes with pipe covering and by using a feedwater heater to heat the returns. In fact, a 1 per cent loss of fuel occurs for every 11 deg. Fahr. drop in temperature of feedwater below 212 deg. Fahr.

It is the little things that count—the little things which can usually be taken care of most easily.

Cellulose, Lignin and Papermaking Studies

Results of recent research in this field of chemistry by German investigators

By LOUIS E. WISE, Professor Emeritus
New York State College of Forestry

THE Republic of Germany gives way to a mediaeval dictatorship. Nazis parade the streets. Censors control the press. The status of certain research workers becomes less and less secure. And yet investigation goes on at white heat, unabated, and the resultant publications are as voluminous as ever. It is only fair to say that many of these articles are of marked importance and of distinct significance to the pulp and paper industry.

For several decades, Germany has been vitally interested in pulp and papermaking research, and in the constitution of cellulose, lignin and other components of wood. Research centers for studying the problems of the papermaker have grown up at Eberswalde and at Darmstadt. At the Technische Hochscule, in the town last named, a new experimental groundwood mill, with a repair shop and control laboratory was installed in 1933.[1]

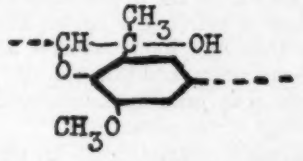
Also within the past year a Paper Museum has been established at Magdeburg. Its trade schools pooled together and collected all types of paper and papermade articles and, according to Professor Dr. von Possanner (Head of the Institute of Paper Making at Coethen-Anhalt), this exhibit will probably be extended to include interesting old documents, watermarks and an extensive library on papermaking.[2]

Cellulose and Lignin Researches

Important investigations on cellulose and its accompanying substances are going forward at several Kaiser-Wilhelm Institutes; at the chemical institute of the University of Berlin; at Heidelberg, Munich, Leipzig and elsewhere. And the Germans believe in publishing their data. It is not surprising, then, that within the past twelve months (from September 1932 to September 1933) so much has appeared in the German literature that the reviewer finds it no small task to compress the results into a reasonably brief space.

A few important books and reports should be mentioned. A translation of Hans Pringsheim's excellent work on the *Chemistry of the Monosaccharides and the Polysaccharides* was published by McGraw-Hill in New York in 1932. In 1932 also, Julius Springer of Berlin published the seventh edition of Herzberg's famous work *papierprüfung* (Paper Testing) revised by Korn and Schulz. The same publishing house brought out Dr. Karl Freudenberg's comprehensive work on *Tannin, Cellulose, Lignin,* in 1933. *Die Papierfabrikation* (Paper Marking) by Dr. Bruno Possanner von Ehrenthal was published in Liepzig by the Deutscher Buchgewerbverein. Supplementary Volume 11A of F. Müller's comprehensive work *Die Papierfabrikation und deren Maschinen* (Paper manufacture and its machinery) was published in 1933 by Güntter-Staib in Biberach-Riss. In Berlin, Otto Elsner's publishing house printed the imposing Report of the Association of Pulp and Paper Chemists and Engineers for 1931-1932, as well as a bibliography on pulp and papermaking collected by the same association (Verein der Zellstoff and Papierchemiker und Ingenieure). A dictionary written by E. Munds gives the German chemical and technical terms prevailing in the pulp and paper industry. It was published by Güntter-Staib in 1933.

In the field of lignin, the principal waste product of straw and wood, Freudenberg and Sohns[3] have extended their knowledge by studying the action of ozonized oxygen. Oxidized in this way, lignin gives acetic and oxalic acid. With chromic acid as oxidant, acetic acid was also formed, but it was never obtained from the polymers of coniferyl alcohol (which some investigators hold are closely akin to lignin). The same chemists also discuss reduction and condensation experiments, the lignosulphonic acids, the nature and the source of the formaldehyde-forming group in lignin, and its absorptive power and lack of optical activity. These various findings lead to the conclusion that the *chief* unit in the lignin molecule *may* be:



which the observant reader will note is slightly different from the unit structure previously proposed by Freudenberg.[4] Other related linkages, however, are not definitely excluded from the lignin complex, by data obtained up to the present. The chemical forbears of lignin and cellulose in wood have been discussed by Wislicenus[5] who for over a decade has been the advocate of the colloidal hypothesis for the "synthesis of wood." The cambium appears as the site of the manufacture of woody tissues in the tree. Here the highly polymerized substances, cellulose and lignin are built up. According to Wislicenus, their origin is *invert sugar;* glucose leading to cellulose, while fructose is the raw material, which after a series of modifications gives rise to lignin.

Improvements in an earlier method for determining lignin have been suggested by Noll, Bolz, and Fiedler.[6] The lignin, which is isolated by dimethylaniline and 78 per cent H_2SO_4 is extracted with alcohol and with water. Due to the removal of resins and cellodextrins the results are naturally lower and greater accuracy is claimed for the method. However, the Noll method did not give entirely satisfactory results when applied

to soda and other commercial pulps, with the possible exception of sulphite pulp, in the hands of Lewis, Koonce and Young.[7] A study of the degradation of cellulose and wood by means of hydrofluoric acid has led Fredenhagen and Cadenbach[8] to devise a new quantitative means of determining lignin. However, the greater part of their article deals with the products of cellulose degradation under the influence of HF.

During the past year, Lüdtke[9] has made an intensive and interesting study of the physical architecture (the morphological characteristics) of various fibers such as pine and spruce tracheids and the best fibers of bamboo and hemp. He uses chemicals, a high power microscope, and resorts to frequent photomicrographs. From these he draws conclusions regarding the structure of plant fibers which are at variance with some of those advanced by Ritter and others.[10] Although he agrees that the middle lamella contains no cellulose, and that its lignin is *not* chemically combined in wood, he disagrees with Freudenberg and his co-workers[11] on the physical makeup of that layer. The "skins" or surfaces of the various units within the plant fiber intrigue Lüdtke. These skins appear to be neither lignin nor cellulose. Nor are they xylans or mannans. What is their chemical constitution? The question remains unanswered. These skins play an important role in swelling (hydration) of fibers. If they are broken, these swelling phenomena are greatly modified.

Lüdtke also holds that the cellulose molecule cannot exceed a length of 1000 glucose units. Otherwise it would be longer than 0.5 micron, and consequently greater than a definite subdivision of the fibril, which Lüdtke christens the *dermatosome*. These little particles are themselves made up of the ultramicroscopic micelles.

A lively polemic on the dependence on temperature of the viscosity of cellulose solutions has been carried out between Hess and Rabinowitch[12] who claim that such dependence exists, and Staudinger[13] who reported that in certain cases cellulose solutions showed viscosities independent of temperature.

Important work, characterized by unusual difficulties, on the constitution of the cellulose molecule has been carried out by Freudenberg and Scoff.[14] This deals with the degradation constants (in the acetolysis reaction) of cellulose and cellobiose: work which space does not permit us to summarize.

For a number of years, Kurt Hess and his co-workers at the Kaiser Wilhelm Institute of Chemistry at Berlin-Dahlem have often stood out against the hypotheses of other investigators regarding the size of the cellulose molecule. Recently, Hess and Ulmann[15] have concentrated their attacks on derivatives of *cellotriose*, a trisaccharide obtained from cellulose. They claim that the molecular magnitude of this "sugar" depends on the pH and on the concentration, and they discount the theory of the usual form of *(primary valance)* in cellotriose. The studies of Hess are brought into question, however, by some very careful experiments by Zechmeister, Mark and Tóth[16] who show by fractionation of the sugar and by determining the physical constants on these fractions that they are dealing with a definite trisaccharide of normal constitution, which fits perfectly into the picture of a homogeneous, primary valance chain in the cellulose molecule. (A trisaccharide, on hydrolysis gives three molecules of the simple sugars; in this case three molecules of glucose.) Karo[17] has attempted to correlate the molecular dimensions of cellulose with its technological uses. Viscosity is the measurement emphasized in seeking to evaluate the usefulness of a cellulosic raw material. Haller and Lorenz[18] propose a new test for oxidized cellulose. Samples of cellulose that had been pretreated with sodium hypochlorite (i. e. oxidized) and subsequently with lead acetate gave, after thorough washing, a blue coloration with cochineal (which veers from red to blue in the presence of traces of lead). The explanation is that the carboxyl groups formed in the oxidation of cellulose chemically retain the lead in the fiber. Commercial aspects of the hemicelluloses are brought to the fore and are discussed at length by Runkel[19] whose article is noteworthy because of a comprehensive bibliography.

Pulping Investigations

Delignification studies have been frequent. A new method for the removal of lignin, with the formation of pulp, consists in heating wood with *dioxane* at about 90 deg. C. The process is patented by Wedekind and Engel[20] who claim that under these conditions the lignin forms a colloidal solution.

The pulping of straw has received some attention. Hilpert, Wolter and Hofmeister[21] studied the action of sodium sulphite solutions on winter wheat straw and esparto, varying the conditions of time and concentration as well as alkalinity. At the early stages of the cook, the sulphite was taken up rapidly, then more slowly as the cook progressed. With increasing amounts of sodium sulphite originally present in the liquor, the maximum amount which was removed during the delignification increased. The potency of spent liquors was found to depend on the amount of free Na_2SO_3 (remaining, or freshly added). Sodium hydroxide, even when added in fairly large amounts does not affect the action of the sodium sulphite liquor. On the other hand, sodium sulphite when added to a soda cook gave rise to a darkened pulp (which, however, is also quite characteristic of straw soda pulps in general). The pH of spent liquors varied from 5.0 to 7.6 in the case of sodium sulphite, and up to 10 in the case of soda cooks. The high pulp yields obtained with Na_2SO_3 are explained in part by the retention of ash and by the high pentosan content. A study of pulping straw with SO_2 and bisulphite under a variety of conditions of temperature and concentration, by Hilpert and Jordan[22] showed that lignin, not silicates, gave rise to the difficulties encountered in the cooking operations. Liquors rich in SO_2 or, if the concentrations were lowered, those containing ammonia gave the best results. Waentig[23] showed that the production of pulp from seed flax straw suffers greatly from mechanical pre-treatment. Shredding, prior to pulping should therefore be avoided.

Bach[24] has determined sulphur in straw before and after pulping. About 60 per cent of that originally present enters the waste liquors causing stream pollution. To obviate this, he suggests an anaerobic prefermentation of the straw at pH 7.2 to 8.0, which he claims can be done without injury to the straw fiber, with removal of a large part of the sulphur, and the formation of a soluble material having fertilizer value.

The sulphite process has been re-examined in Germany, and the moot questions of different systems of forced liquor circulation have been debated. Brobeck[25] describes his own technique, while Abele[26] favors that of Schauffelberger, which has also been described by Samson.[27] The latter emphasizes the necessity of providing the proper mechanical equipment for each individual digester. The actual savings in raw materials, temperature, etc., due to forced circulation is the theme of Ehninger.[28] This author's discussions merit attention since they furnish criteria of various factors to be considered before a new system is installed.

Professor Dr. Jonas, head of the Paper Making Institue at Darmstadt,[29] reports on the use of high SO_2 concentrations in sulphite cooking liquors, throwing doubt on the hypothesis that hydrolysis occurs during the cook. Working with and maintaining high concentrations of SO^2 gave high yields of pulp, the physical properties of which remained unimpaired. Jonas presents a considerable body of experimental data as well as a good resumé of the literature. He explains the experimental conditions under which a high SO_2 concentration (up to 32 per cent) may be used.

A transparent, experimental digester, which can be operated at 150 degrees and 12 atmospheres pressure, is described by Hilpert and Hofmeier.[30] Using a glass autoclave, which they describe, Gerngross and Hoffmann[31] have followed the changes in the cell membrane during sulphite digestion. They studied the effects of digesting sections of wood taken from various parts of the tree. In determining its effect on sulphite digestion and on the quality of pulp produced, E. Richter[32] studied the action of salt solutions on wood. After soaking in brine for several months, wood took up small but appreciable amounts of salt, which gave rise to a noticeable decrease in pulp yield and a very marked decrease in the strength of the bleached stock. The pulp was yellow, its percentage of cellulose had decreased and its copper number was higher. Evidently, salt water, through which many logs on the Pacific Coast are rafted, has a deleterious effect on the resultant pulp. This work substantiates that of Zelani[33] who showed that more than 0.02 per cent free HC^1 in sulphite liquor causes a decrease in fiber strength. That furfural is formed in the sulphite cook, due to hydrolysis and conversion of the pentosans of the wood was reported by Spielmeyer.[34] Possibly the furfural test may serve in determining when the digestion is complete. Soltau[35] has shown that just prior to the blowing of a digester, appreciable amounts of SO_2 (as much as 1 per cent) are held in the waste liquors. Ordinarily, this is lost, but it may be recovered with profit by the use of special equipment.

For a decade, Pritzkow[36] studied pulp and paper mill effluents. He has recently made a progress report (with literature references) on the purification and disposal of waste liquors. A control method for determining the total sulphur content of waste liquors, devised by Margot Dorenfelt-Holtan[37] depends on the treatment of the liquor with normal alkali under standardized conditions, followed by the careful oxidation of all the sulphur to sulphate by the use of fuming HNO_3. The final determination is made as $BaSO_4$.

The remainder of Dr. Wise's article will appear in a subsequent issue of this magazine.

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Experiments with Inks and Dyes

AFTER considerable experimentation, the Bureau of Standards has found a writing ink which apparently will not deteriorate paper. The Bureau found by inking papers and subjecting them to accelerated aging by applying heat, that the ordinary acid type of writing ink caused rapid embrittlement of the papers; in some cases the folding endurance of the papers was decreased as much as 50 per cent. The type of ink believed to be satisfactory is alkaline; ammonia replaces the acid of the usual type of ink. There was practically no embrittlement of papers inked with this preparation when subjected to the heat test.

Contrary to statements made by experts on disputed documents that the blue dye in writing done with the ordinary blue-black ink will all be oxidized away in 15 years, C. E. Waters, of the Bureau of Standards, found on examination of 147 samples of writing 15 or more years old, that blue dye was present in 78 of them. One of the specimens of writings which still contained blue dye was 52 years old. On the other hand, 4 samples of writing only 15 years old showed no evidence of blue dye. It is evident that the presence or absence of dye is not a safe criterion of the relative age of writings. In a report of this work published in Industrial and Engineering Chemistry, September 1933, the variability of the composition of writing ink, of the amount of ink in the written characters, and of the conditions under which the writing is kept, are mentioned as influences which affect the rate of disappearance of the dye.

Notes on the Purity and Permanence of Wood Fibers

By CHARLES A. BLAISDELL and JESSIE E. MINOR

PERMANENCE is usually studied in connection with high grade papers, intended for long storage, but it is important for all grades of paper to know the extent to which the properties for which it is purchased will be maintained during the normal life period of the paper. Even a newspaper should maintain a reasonable color for a few days and the cheaper magazines utilizing the same type of paper should maintain their color and strength for at least a month.

The data of this report was obtained in an effort to correlate purity and permanence in the lower grades of paper and also to ascertain whether any of the usual methods of determining permanence could be applied to these cheap wood papers intended for a short life span. The papers chosen for carrying out this work were a very white facial tissue made of highly bleached sulphite wood fibers and a cream colored toweling made of underbleached sulphite wood fibers.

Purity not Criterion of Permanence

Upon examination, the chemical constants, indicating the chemical purity of fibers for these two papers, showed that in pH, copper number and alpha content, the facial tissue is superior to the toweling and should be considered as made of fibers of higher purity although the viscosity would indicate that considerable fiber strength had been sacrificed in obtaining that purity. Further tests indicated that the fibers of the purer facial tissues are less resistant to degradation in dark storage or on exposure to light and air than are those of the toweling which had been less purified. Therefore, for this grade of fibers, high purity is not a criterion of permanence quality in the paper.

The interest in the work of permanence testing centered around evidence as to whether the loss of power to absorb liquids for samples aged for a series of time periods is parallel to the time changes in the copper number or to changes in the power of fibers to adsorb moisture from the atmosphere after having been subjected to such aging. If this loss of absorbence power with age, which often occurs in normal storage, is due to a gradual chemical degradation of the fibers, then oven aging would be expected to show an increase in copper number parallel to the loss of absorbence power. If it is due to changes in the physical structure of the fibers, oven aging would be expected to show a loss in the power to adsorb moisture from the atmosphere parallel to the loss of liquid absorbence. Since moisture is drawn into paper by means of the attractive forces of the interior surface layers, any physical change of the fiber structure which tends to alter the intensity of the attractive force or the amount of active surface, such as closing the ends of the capillary tubes to penetration or breaking such tubes into shorter pieces, will affect the power of absorbence.

The increases of copper number for oven aging were found to be slight as compared to the marked loss of absorbence power and followed a differently shaped curve for the early part of the period. However, changes of copper number on oven aging may be taken to indicate a roughly corresponding change of power of absorbence.

The copper number for light aging was found to increase considerably with time as does the absorbence power, but there is no apparent relation between the two factors indicating that absorbence changes due to light exposure are not closely related to chemical degradation of fibers. However, the increase is decidedly marked for the facial tissue in contrast to the toweling and indicates that tests for the copper number changes with light would probably give an approximate indication of the susceptibility of such paper to loss of absorbence on storage.

A definite change in absorbence which is not related to chemical degradation might be due to some change in the physical structure of the fibers. Such physical change is best measured by the total amount of moisture adsorbed from an atmosphere of standard humidity by samples of the same paper which had been aged for an increasing series of time periods. Results of such tests indicate that there was a progressive loss of power to adsorb moisture from the atmosphere and also of the power to allow liquid flow and that either of these two tests could be used with oven aging as an indication of what might be expected to occur in normal dark storage over a corresponding period of time.

The chemical constants obtained on original samples of these two papers without oven aging, are given in Table I.

From this data, it is apparent that in pH the facial tissue is less acid than is the toweling though both are within the limits considered safe for permanence. In copper number and alpha content the facial tissue shows a greater degree of purification than does the toweling. Possibly this purification was at the expense of fiber strength since the viscosity for the toweling is almost double that for the facial tissue. The resin content in both cases is approximately the same and is probably normal for sulphite cooked wood pulp.

It is generally understood that a dark heated oven accelerates such reactions as are due to impurities in the paper while the ultraviolet light rays of the mercury arc hasten the deteriorating effect of ordinary daylight and air. Work reported by the Bureau of Standards on toweling was said to confirm the fact that strength as measured by burst and tensile is not appreciably affected by accelerated aging. The tests of folding and brittleness which are sensitive to such aging are not practical for creped paper of such low strength. Therefore, the absorbence test only was used as a measure of the desirable physical properties of this grade of paper.

Absorbence Test Methods Explained

There are two general types of absorbence tests which have been recognized commercially: one is the area or time consumed by the spreading of a standard drop upon the surface, the other is the amount of capillary rise of a liquid in vertical strips of paper with ends immersed for a standard length of time. A preliminary study of these two methods with our test papers indicated that the surface drop method gave results with a greater concordance in duplication of individual tests and showed a greater sensitivity to degradation than did the capillary rise method. Indications of the difference in sensitivity of the two tests are given in Table II.

The drop method used was based on that recommended by the Government Printing Office and by Cross and Bevan. The paper was stretched over a lipped cup at a distance of two inches from the tip of a dropping burette containing the standard ink and the absorbence was measured by the time taken for a drop to be absorbed to the extent of no further reflection of light. All tests were made in an atmosphere of constant humidity on samples which had been conditioned to equilibrium with that atmosphere.

The copper number tests were all made by the Braidy standard method. The dark aging was done in a large Freas oven equipped with a rotating disk from which the samples were hung and which insured for the samples uniform heating and a normal circulation of the air in contact with the paper. The standard temperature of 100 deg. C. was maintained but the period of heating was ten hours instead of the usual seventy-two hours consistent with the shorter normal span for this grade of paper. The light aging was carried on

with a Victor X-ray ultraviolet light equipped with a cylinder for holding the paper at a distance of 10 inches from the tube at a temperature of 38 deg. C. or about 100 deg. Fahr. The maximum time of light exposure was one hour instead of the usual 7 hours to again conform with the shorter life span for this grade of paper.

The relation between copper number, liquid absorbence and moisture adsorbence for these papers is indicated by data given in Tables III and IV and by Graphs I to IV inclusive.

During the first hour of oven aging, Table III, Graph I, the loss of absorbence and of adsorbence was large as compared to the change in copper number, no doubt due to the fact that physical changes occurring in connection with the drying out of moisture were occurring in the fibers. This would indicate that the variations in moisture conditions of normal storage complicates the interpretation of this period of oven aging in terms of time of normal storage. The periods between 1 and 3 hours of oven aging would indicate that the drying out effect on absorbence was decreasing with the moisture content. The very interesting break in curves for both copper number and absorbence at the three hour period and the relative parallelism of the remainders of the curves would indicate that after three hours fiber degradation alone was responsible for the loss of absorbence. In this way, copper number is taken as a measure of the amount of degraded fiber present.

In Graph II for toweling the effect for drying out during the first hour was decidedly less than for the more purified facial tissue. In spite of the relatively large copper number for the toweling before aging, the increase for oven aging was also slight as compared to that of the purer fibers and gave no indication of the break at the end of three hours. This break after 3 hours is apparent with the absorbence curve though at a much lower point than for the facial tissue. The adsorbence curve seems to follow an entirely different shape, no doubt due to the effect of impurities upon the form of degradation occurring.

A comparison of the data of Graphs I and II indicates that the total increase of time of liquid absorbence for the facial tissue is 173 per cent of the original while for the toweling under the same conditions it is only 64 per cent of the original. Most of this difference occurred during the first hour of aging and indicates the increased sensitivity of purified fibers to structural deterioration.

For the purer facial tissue the increase of copper number is 0.458 or 23.7 per cent of the original while for the less pure toweling the increase is only 0.089 or 2.9 per cent of the original. This again indicates that high purification is apt to result in instability and impermanence. The order of change in both cases would indicate that any appreciable increase of copper number with oven aging will be accompanied by a corresponding change in the power of absorbence. However, the copper num-

TABLE I

Chemical Contents of Samples

	Facial Tissue	Toweling
pH of water extract	6.0	5.0
Copper number	1.925	3.046
Alpha content	87.18%	85.77%
Viscosity	17.35	32.40
Resin content	0.354%	0.358%

TABLE II

Comparison of Methods for Absorbence Testing.
Average of Results of Tests on Facial Tissue.

	Time of Exposure to Light in Minutes.				
	0	15	30	45	75
Capillary rise, inches	2.52	2.74	3.31	3.42	3.44
Drop method, seconds	8.1	6.4	4.5	3.4	3.4

TABLE III

Oven Aging of Samples at 100°C.

	Facial Tissue			Toweling		
Time in Oven, Hours	Liquid Abs. Seconds	Copper Number	Regain of Original Moisture	Liquid Abs. Seconds	Copper Number	Regain of Original Moisture
0.0	8.1	1.925	100%	10.8	3.046	100%
0.5	12.6			12.4		
1.0	15.5	2.060		14.7	3.058	
1.5	16.9			15.3		
2.0	18.0	2.089	92	15.6	3.061	95
2.5	18.9			15.9		
3.0	19.7	2.104		16.1	3.074	
3.5	20.5			16.4		
4.0	21.0	2.203	91	16.8	3.082	94
4.5	20.7			17.1		
5.0	21.0	2.308		17.1	3.084	
5.5	21.3			17.2		
6.0	21.2	2.360	88	17.5	3.101	98
6.5	21.5			17.4		
7.0	21.7	2.383		17.5	3.135	
7.5	21.5			17.8		
8.0	21.9		90	17.7		89
8.5	22.0			17.8		
9.0	22.0			17.7		

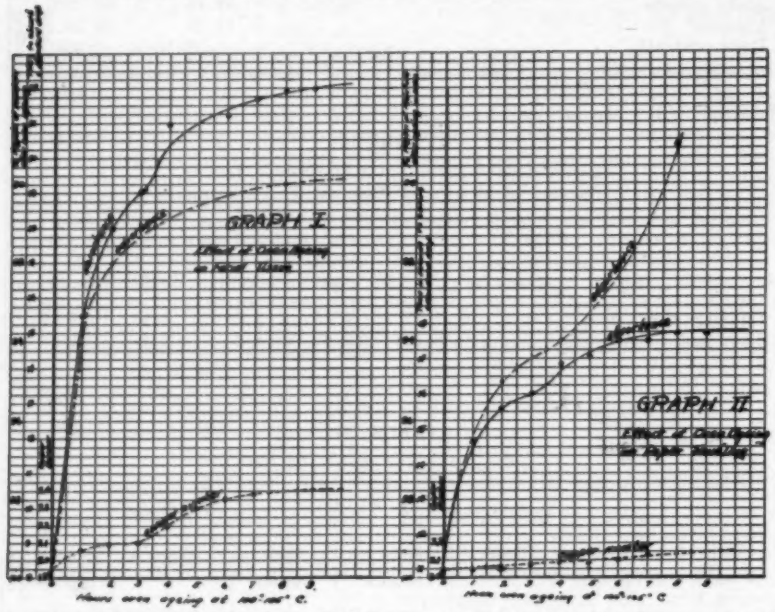
TABLE IV

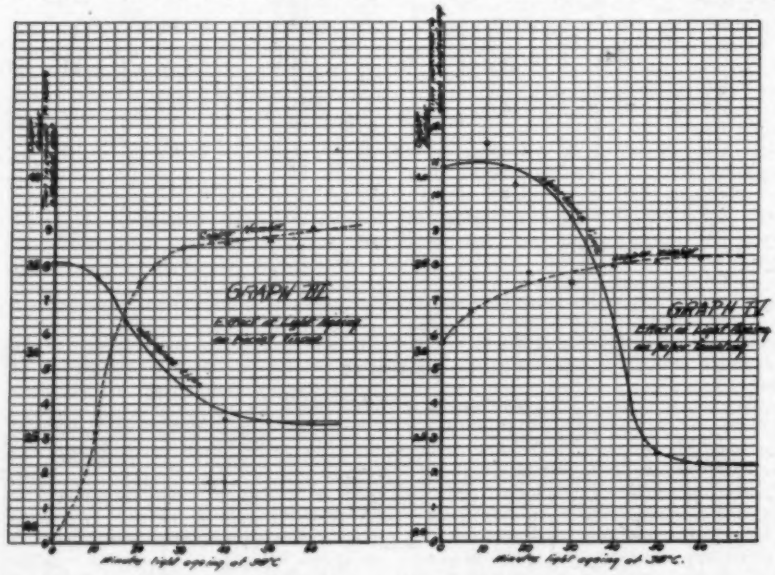
Light Aging of Samples at 30°C.

Time of Exposure Minutes	Absorbence Time Seconds	Copper Number	Absorbence Time Seconds	Copper Number
0	8.1	1.925	10.8	3.046
5	7.2		10.4	
10	7.7	2.537	11.5	3.230
15	6.4		9.6	
20	6.4	3.405	10.3	3.451
25	5.1		8.9	
30	4.5	3.603	9.3	3.405
35	4.1		8.3	
40	3.6	3.623	6.2	3.494
45	3.4		3.7	
50	3.5	3.638	2.6	3.525
55	3.5		2.0	
60	3.4	3.717	2.3	3.539

ber is more tedious of manipulation and gives indications only after aging so it would seem to have no particular advantage over the time of absorbence as a test for the permanence of this type of paper.

In papers containing considerable of natural resin as in ground wood fibers, the loss of absorbence or waterproofing on oven aging is quite marked. But if the paper is first extracted so as to remove all of these natural resins, the loss of absorbence with age becomes slight. From the above data, the effect of resins must have been the same on both papers and could not have brought about the wide difference in rate of loss of absorbence shown by these papers.





Effects of Daylight Aging

The data of Table IV indicates the effect of ordinary daylight and air upon these papers. The ultraviolet light is rich in the type of rays that bring about fiber oxidation and degradation.

Light aging, contrary to oven aging, Graphs III and IV, caused an increased power of water absorbence. Probably strength tests would have indicated an increasing brittleness parallel to the increasing absorbence. Also, contrary to oven aging, the total change of absorbence power for the facial tissue was less than for the toweling, though for the first 40 minutes the changes for the two samples were approximately parallel. The marked drop for the toweling after 40 minutes' exposure was not seen for the facial tissue.

The copper numbers for both papers increased during the first 20 minutes to about the same amount but in doing so that of the facial tissue increased over its original figures by 60 per cent while the toweling increase was only 13 per cent above the original figures. At the end of 60 minutes the copper number for the facial tissue was distinctly higher than that for the toweling. Thus again the facial tissue, in spite of its greater purity, is shown to be less resistant to accelerated aging than the toweling with its less original purity.

The rapid increase of copper number for the facial tissue during the first 30 minutes of light aging paralleled the increase of absorbence time during the first 3 hours of oven aging and indicates that the increase of copper number after a short period of light aging might be considered as indicative of the probable change of absorbence during storage.

In the above discussion it has been attempted to show that:

1—High purification of fiber does not necessarily imply high permanence.

2—The original copper number of papers of this type gives no clue as to the permanence quality of the paper.

3—A marked change of copper number with oven or light aging may be considered as indicative of a marked loss of absorbence quality with normal aging.

4—Changes of absorbence quality with oven aging are due to both a drying out of moisture and a chemical degradation of the fibers.

❖ ❖ ❖

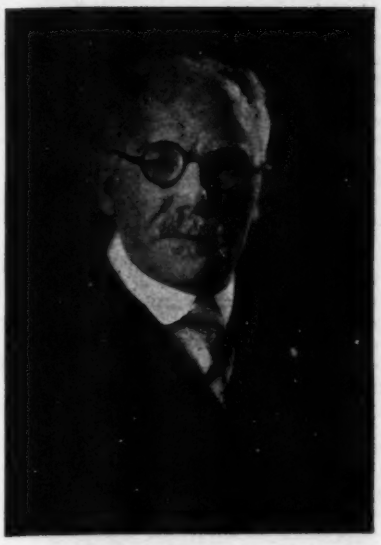
◆ Paper and Pulp Codes are Signed

On November 17, President Roosevelt signed the General Code and Subordinate Divisional Codes of Fair Competition for the Paper and Pulp Industry. The General Code became effective November 27, and will be administered by the members of the Executive Committee of the American Paper and Pulp Association. The members of this committee are: President S. L. Willson, American Writing Paper Co.; H. W. Ellerson, Albemarle Paper Mfg. Co.; A. R. Graustein, International Paper Co.; S. B. Copeland, Eastern Mfg. Co.; F. J. Sensenbrenner, Kimberly-Clark Corp.; Hugh J. Chisholm, Oxford Paper Co.; N. W. Wilson, Hammermill Paper Co.; J. D. Zellerbach, Crown-Zellerbach Corp., and D. C. Everest, Marathon Paper Mills Co.

Divisional Codes, which are subordinate to the General Code, are also effective for the following divisions: Binders Board, Blotting Paper, Bogus Wrapping and Packing, Book Paper, Bristol Board, Cardboard, Cellulose Wadding, Cover Paper, Fibreboard, Glassine and Greaseproof Paper, Groundwood Paper, Kraft Paper, Leatherboard, Paper Shipping Sack, Pulp Producers, Soda Pulp, Specialty Paper and Board, Sulphate Pulp and Board, Sulphite Paper, Tissue Paper and Writing Paper.

The Code of Fair Competition for the Newsprint Industry was also signed November 17, but this code is not subordinate to the General Code.

Approved Code No. 119 (Newsprint Code) and Approved Code 120 (General and Subordinate) may be obtained for 5 cents per copy from the Government Printing Office, Washington, D. C.



Lyman Derby Post

A host of friends and acquaintances of Lyman D. Post, Publisher of *The Paper Mill and Wood Pulp News*, and familiarly known as "Derb" or "L. D.," will regret to learn of his passing. His demise took place on Thanksgiving Day, November 30, in Miami, Fla., where he had gone, accompanied by Mrs. Post, less than a week before from his home in Sea Girt, N. J.

Mr. Post was one of the best known personalities in the pulp and paper industry. He was an inveterate traveller among the mills and among the manufacturers of equipment and supplies for the industry. Likewise, important conventions of the various organizations associated with the industry during his long span of business activity most always found him in attendance.

Born of Dutch ancestry on Staten Island, he early associated himself with journalism and for more than fifty years was publisher of *The Paper Mill and Wood Pulp News*, which stands as a monument to his interest in and his loyalty to the paper trade.

◆ Plans for 1934 Supers Annual Meeting

The fifteenth annual convention of the American Pulp and Paper Mill Superintendents Association will be held at the Poland Spring House, South Poland, Maine, June 20, 21, and 22, 1934.

K. E. Terry of the S. D. Warren Co., Cumberland Mills, Maine, will be General Chairman, assisted by Luther Parkman, of the same company.

The annual golf tournament will be held on the hotel links immediately adjoining the hotel June 20.

◆ Processing Tax on Paper for Specific Uses

Effective December 1, rates of compensating taxes on jute fabric, jute yarn and paper for specified uses were fixed by the Secretary of Agriculture, in accordance with those provisions of the Agricultural Adjustment Act which empower the imposition of a tax on commodities that obtain competitive advantages over a basic commodity, because of the imposition of a processing tax on the basic commodity.

The compensating rate of tax on paper was fixed at 2.04 cents per pound weight of paper on its first domestic processing into multi-walled paper bags; 3.36 cents per pound weight of paper on the first domestic processing of coated paper into coated paper bags; 2.14 cents per pound weight of open-mesh paper fabric, on the first domestic processing of open-mesh paper fabric into open-mesh paper bags; 0.715 cents per pound weight of paper on its first domestic processing of paper into paper towels; and 4.06 cents per pound weight of paper on the first domestic processing of paper into gummed paper tape.

◆ Drying Agents Compared

Investigations of the suitability of various laboratory drying agents have been relatively few. Essential characteristics of ideal desiccating agent: (1) It should remove moisture rapidly, regularly and completely; (2) it should be as stable as possible under ordinary atmospheric conditions; (3) it should show some indication when it has taken up so much water as to render it no longer usable; (4) it should be easy to handle; (5) it should preferably be easily reactivated.

Actual desiccating action is most important of the properties, and following agents are arranged in decreasing order, an approximate numerical value being provided by the pressure of the water vapor over it at room temperature:

Calcium chloride	0.20m.m.
Sodium hydroxide (fused)	0.16m.m.
Potassium hydroxide (fused)	0.003m.m.
Alumina	0.0025m.m.
Concentrated sulfuric acid	0.0020m.m.
Barium oxide	0.0010m.m.
Silica gel	0.0010m.m.
Barium perchlorate	0.0010m.m.
Magnesium perchlorate	0.0005m.m.
Magnesium perchlorate ($+3H_2O$)	0.0003m.m.
Phosphorus pentoxide	0.0002m.m.

Figures emphasize relative inefficiency of sulfuric, and particularly of calcium chloride, and show phosphorus pentoxide to be the best drying agent, although there are several others which are almost as good.

Particular advantages of magnesium perchlorate are its freedom from stickiness and channeling associated with calcium chloride and phosphorus pentoxide when these absorb water. In addition, it remains porous, it does not attack cotton-wool plugs, and since it contracts in volume, it is easily removed from gas-drying U-tubes without possibility of breakage which is usual with phosphorus pentoxide. Its moisture absorption capacity is over 30 per cent of its own weight, and it can be regenerated by heating at about 200 deg. C. for ten hours.

Freshly ignited barium oxide is another promising material which compares favorably with phosphorus pentoxide, although exact data are not available. There seem to be possibilities also with boric acid. *(Chemical Trade Journal* (London), Sept. 15, p. 198.—Reprinted from November, 1933, issue of *Chemical Markets.)*

◆ Carborundum to Honor Superintendents

The Carborundum Company of Niagara Falls, N. Y., will honor the American Pulp and Paper Mill Superintendents Association in its Radio Broadcast on Saturday night, December 16, 1933, over the following stations of the Columbia Broadcasting System, at 9:30 p. m. Eastern Standard Time, 8:30 p. m. Central Standard Time:

WCAO—Baltimore
WAAB—Boston
WKBW—Buffalo
WBBM—Chicago
WHK—Cleveland
CKLW—Detroit (Windsor, Ont.)
KMBC—Kansas City
WHAS—Louisville
WCCO—Minneapolis
WABC—New York
WCAU—Philadelphia
KMOX—St. Louis
WBT—Charlotte

◆ New Designations for Titanium Pigments

Titanium Pigment Co., Inc., New York, announces that Titanium Pigments are now being designated as follows:

Titanox-A (Titanium Dioxide). Previously designated as Pure Titanium Oxide.

Titanox-B (Titanium Barium Pigment). Previously designated as Titanox B (Barium Base).

Titanox-C (Titanium Calcium Pigment). This was previously designated as Titanox-C (Calcium Base).

Other than in the above designations there are no changes in these pigments, the composition and physical characteristics remaining the same.

Some time may be required to replace present warehouse stocks now packed in bags bearing the old designations.

◆ Arthur Eugene Brady

Arthur Eugene Brady, vice president and treasurer of Jenkins Bros., New York City, passed away November 4 at his home in New York at the age of 58.

Mr. Brady was born at Athens, N. Y. In 1893 he moved to New York and became associated with Jenkins Bros. the same year. He had been in poor health for several years but had maintained an active interest in the tasks of his office up to the time of his passing.

◆ Dr. Wise Has New Post

Dr. Louis E. Wise, noted organic chemist and emeritus professor of forest chemistry at the New York State College of Forestry, Syracuse, N. Y., has been appointed professor of organic chemistry at Rollins College, Winter Park, Fla.

Rollins College is to be congratulated for choosing Dr. Wise to fill this post.

◆ New Meter Design

A complete re-vamping of design is announced by the Republic Flow Meters Company, Chicago, which brings a new note of beauty and simplicity to their entire line of flow meters. The new engineering features of design are to be found in the method of assembling the actuating elements in the various reading instruments.

Republic's new design is built around a cartridge sealed element of the actuating unit which forms a compact, sturdy element ready for mounting on the in-

strument panel. There are three types of reading instruments, the indicator, the recorder and the integrator, each with its actuating mechanism mounted in a separate and distinct cartridge sealed element which is interchangeable and may be easily removed from the back of the panel. The metal cartridges protect the elements from dirt, moisture and abuse.

This simplification in instrument design and assembly has been carried through the entire line of Republic reading instruments, including the two and three pen multiple recorders which combine records of flow, pressures, temperatures, etc., on one chart.

◆ APMEW Wheeler Shower Pipe

A recent announcement of the American Paper Machinery and Engineering Works, Inc., of Glens Falls, New York, describes their APMEW Wheeler Shower Pipe. The pipe, made of hard copper alloy tubing with the lip against which the shower water impinges, plated with chromium, is built in popular sizes for any width of paper or pulp machine. It has been made in 9, 10, and 17 ft. lengths and in 2 and 2½ in. in diameter. The openings, usually numbering 30 in size, are spaced from two to three inches apart.

According to the manufacturers the outstanding feature of the pipe is its long life. Holes in tubing after four years of use are said to have been enlarged only .010 of an inch. The old holes may be closed by soldering and new ones redrilled.

It is further stated that this design of pipe is being used satisfactorily on both fresh and white water.

◆ New Close Coupled Turbine-Gear Equipment

A new line of close-coupled, turbine-gear sets, each set consisting of a steam turbine and speed reducing gear, has been announced by the General Electric Company. The sets are said to be particularly applicable where exhaust steam can be used for heating purposes.

The housings of the turbine and gear are bolted together to form a single structure supported on the base of the turbine. The turbine can be arranged to operate at steam pressures up to 400 pounds, temperatures up to 750 deg. Fahr., and back pressures up to 40 pounds gauge. The speed of the low speed shaft may be within the range of 180 to 3000 r.p.m.

The capacity of this new line of turbine-gear sets ranges from 10 to 150 hp.

◆ Rustproofer in Colors

What is claimed to be an entirely new rust-arresting and rust-preventing principle has been employed in a "Rustproofer" recently put on the market by Stonhard Company, 401 N. Broad St., Philadelphia.

This material comes in liquid form and can be either brushed or sprayed over new or rusted metal surfaces. When applied to a rusted surface, the action of the liquid is stated to automatically weld this inert mass to the base metal and to instantly stop the rust action. Further, a non-porous, moisture-proof, air-tight coating is said to be formed that renders the surface immune to the attack of further rust deposit.

The original treatment can be made into a finish coat by a single application if desired. In addition, aluminum powder, powdered graphite, or dry red lead may be mixed with this Rustproofer and applied to rusted metal surfaces to obtain a decorative finish.

◆ Weston Photo-electric Kit

The Weston Electrical Instrument Corporation, 614 Frelinghuysen Ave., Newark, N. J., has just announced a new, inexpensive photo-electric kit which is being marketed especially for those engineers and manufacturers who prefer to do their own experimenting with photo-electric control for mechanical equipment, operations, and for processes of various kinds.

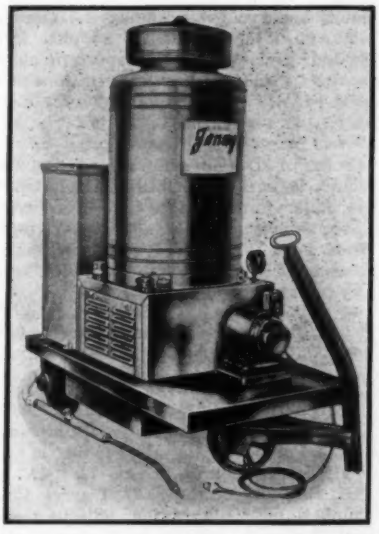
The cell included in the kit is the Weston Photronic Cell. As far as is known, this cell has unlimited life and the output is constant. Its spectral response is about the same as the human eye, so that it is extremely sensitive to color changes and is finding application wherever processes must be controlled by changes in color.

◆ Model "D" Hypressure Jenny

The Homestead Valve Manufacturing Co., Coraopolis, Pa., have announced a new, fully-automatic model of the Hypressure Jenny, its high powered machine for all-purpose cleaning and paint-stripping, or sterilizing. This improved and simplified unit is termed Model "D."

The new model is electric-motor driven, operating on lighting current, and is arranged for instant starting from a push button switch. This fuel-oil burner used for heat generation is of the pressure atomizing type. Ignition is by an automatic electric spark. One of its important mechanical improvements is the use of rotary solution water and fuel oil pumps, direct-connected to the ¼ hp. motor.

From the operating standpoint, the two outstanding developments in its design are the saturation selector and nozzle control. By means of the saturation selector, the operator can obtain any degree of vapor saturation from a heavy, cutting spray for removing heavy deposits of dirt, grease, or other foreign matter, to a light misty spray for the most delicate jobs, such as clean-



ing painted surfaces, etc. This saturation control has been made independent of the pressure carried on the generator, which is itself adjustable to any pressure from 50 lb. to 175 lb.

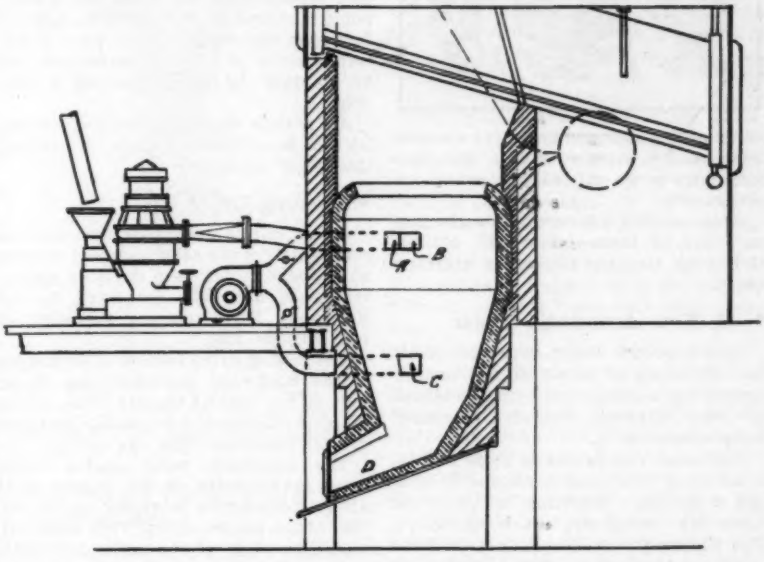
The nozzle control gives the operator full control of all machine functions while working, and permits the continuous automatic operation of the machine without attendance. The motor, generator pumps and fire start when the vapor outlet valve is opened, and stop completely when it is closed; whether

the valve be at the machine, or on a cleaning gun at the end of several hundred feet of hose.

The Model "D" Hypressure Jenny has been made fully enclosed and compact, for maximum ease of handling. The portable type, as shown, is only 30 inches wide, 55 inches long and 70 inches high, enabling it to pass through any ordinary doorway, or enter any ordinary elevator.

♦ Gyro Gasifier Pulverized Fuel System

Something out of the ordinary in pulverized fuel burning systems in the combination of gasifier furnace, pulverizer, and means of firing, has been developed under protected patents by Duffield Coal Products, Ltd., London, England, a firm which is represented on this continent by Ferguson Engineers, Monadnock Block, Chicago, U. S. A., and Toronto, Canada.



In operation, pulverized coal, carried by a small part of the air required for combustion, is admitted tangentially and at high velocity into an inverted pear-shaped furnace, without burner, at inlet A. Secondary air is admitted parallel with the fuel between the fuel inlet and the furnace wall at inlet B, and also through a lower inlet C. By the regulation of the secondary air through these B and C inlets, the height of the flame above the furnace cowl, which corresponds to that of a gas jet flame, is adjusted to suit the space above the furnace. Only mild temperatures are said to be encountered near the gasifier furnace walls, the extreme temperatures being reached above the furnace cowl where the combustion is completed. Preheated air may be admitted through any one or all air inlets.

Due to the action of the fuel and air within the furnace, it is claimed that the fuel remains suspended until completely gasified; and that slag is deposisted on the internal wall from which it runs down, is aerated and cooled by the air entering the lower secondary air inlet and falls into the ashpit D from which it can be removed in a dry porous form. The thickness of the slag adhering to the wall is governed by the fuel, load conditions and combustion control.

Further claims indicate that this furnace will burn regularly from 6 to 10 pounds of coal per hour per cu. ft. volume of gasifier furnace and that it will burn the highest to the very lowest grades of coal with remarkable success in both operation and efficiencies.

The pulverizer has both parallel and conical grinding surfaces, which are said to enable the machine to classify the material and to deliver a remarkably consistent, well-pulverized product.

The particular advantages claimed for the entire system include: greater fuel burning capacity in a given space, higher furnace and boiler efficiency, lower first cost, lower maintenance cost, and large recovery of the fuel ash in the ashpit which reduces the fly-ash trouble to approximately the stoker class.

♦ Waste Heat Recovery System

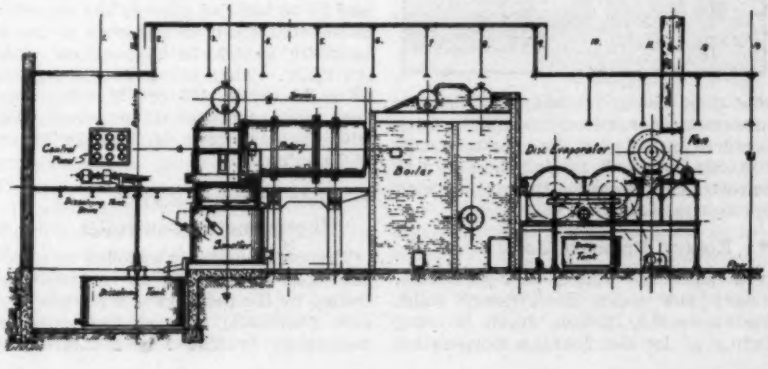
The D. J. Murray Manufacturing Company of Wausau, Wisconsin, has announced the development of the Murray-Waern Sulphate and Soda Waste Heat Recovery System, upon which, in addition to patents allowed, are patents pending. Special consideration in this development to the design of the smelter, with the idea of increasing efficiency and reducing maintenance, has resulted in a special type of patented round air-jacketed smelter with a sloping bottom. The round construction is claimed to prevent bulging of brick work, since all strains are outward against the shell. The design also included means to obtain more uniform air distribution throughout the fuel bed and for preheating of primary air for the blow-pipes. This primary air is preheated by its circulation through an air jacket serving the combined purpose of reclaiming the heat radiated from the refractory and at the same time cooling it. It is claimed that this preheated air improves combustion. A very small amount of refractory is said to be used in the new design, because of a special water wall arrangement which makes the use of a large amount of refractory unnecessary.

The smelter comprises an independent self-contained steam generator, advantage being taken of radiant heat for steam immediately at the smelter. This arrangement may be installed in any recovery unit now utilizing a smelter. Thus steam can be produced at the smelter instead of making it necessary to install a large boiler after the rotary. To receive all of the benefits possible from the waste heat, however, a large boiler should be installed at this point as well. In fact, about 30 per cent of the total steam available from the fuel may now be produced in the smelter and 70 per cent from the main boiler.

From 10,000 to 11,000 pounds of steam per ton of pulp are claimed to be made available from the operation of a complete unit of this kind.

For the purpose of insuring complete combustion a special patented water cooled type seal between the smelter and rotary was developed to effectively seal off this connection from large volumes of excess air. The ash passes directly over the closed seal apparatus into the middle of the furnace. The seal arrangement is claimed to be built so that it requires practically no attention or maintenance.

Attention was also given to the main boiler design — the new design being adapted to high pressure operation 500 lbs.—100 deg. superheat. An economizer may also be used in certain cases. Draft,



air, liquor feed, temperature, etc., are all controlled from a main control panel.

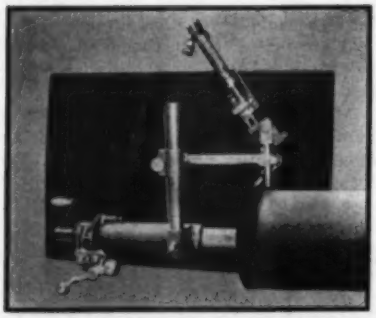
A patented disc evaporator of the baffle wheel scrubber circulating type is included in this system. In operation the revolving of the baffle wheel picks up quantities of liquor and cascades it from baffle to baffle. This action forms a dense rain of liquor through which the gases must pass. At the same time the gases are being deflected or baffled from plate to plate. Right angle turns and intimate contact of liquor and gases greatly increase the rate of evaporation. Chemical dust losses are likewise reduced. The circulation speed is claimed to keep the disc tank clean and mixes the liquor into uniform consistency. The liquor is fed to the evaporator through a positive feed pump of the metering type, which is also controlled from the main control panel. A special metering device for the metering of salt cake into the black liquor before it is sent to the rotary may also be utilized.

Chemical reduction in units of this design has been as high as 97 per cent over a long period of time according to the manufacturers. Likewise, liquor with a concentration of 24 deg. Bé. at 180 deg. Fahr. is considered sufficient for good operation.

◆ Oxweld Pipe Cutting Machine

Another new cutting machine has been announced by The Linde Air Products Co., 30 East 42nd Street, New York City, as an addition to its Oxweld line of apparatus, known as the Oxweld pipe-cutting and beveling machine. It consists of a center rod with three spreading arms which press against the inner wall of the pipe, holding it in position, with an arm supporting a blowpipe that can be adjusted to the desired angle of the cut. The blowpipe and arm rotate without the use of a crank for quick centering of the device, and by means of a crank when doing actual cutting.

It is claimed that this machine will take almost any hand-cutting blowpipe,



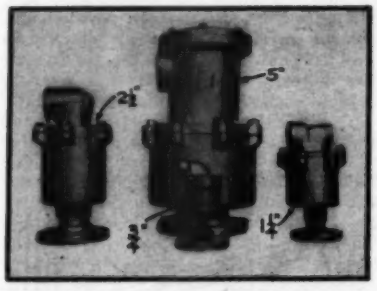
that it is readily portable, and that its operation is extremely simple. Once centered in the pipe, the operator merely turns the crank causing the blowpipe to rotate evenly around the pipe, making a clean machine-like cut.

◆ Rotary Pressure Joint

A packless, oilless, non-adjustable, rotary and steam fit pressure joint, known as the Johnson Joint, is being furnished by the Johnson Corporation of Three Rivers, Mich., for use on paper machine dryers, corrugator rolls, calender rolls and similar service.

The construction of this joint provides both lateral and angular flexibility which compensates for movement of rolls in bearings, pipe expansion, etc., and eliminates strains on the joint from such sources.

The joints are pressure sealed through the use of composition seal ring which is water lubricated. It is claimed that



joints of this type are operating successfully on 200 steam pressure and that they require no oil, adjustment or replacements.

More detailed information on the construction of these joints will be furnished by the manufacturers upon request.

◆ A New Automatic Timer

A new electric timer that lends itself to a multitude of automatic and remote-control applications has been announced by the General Electric Company, Schenectady, N. Y.

The timer, designated as Type TSA-10, is all electric—timing is started by closing a switch. Resetting is automatic when the control circuit is deenergized. The timing period is readily adjustable over a wide range. When used as a process timer it can be arranged to operate a signal or terminate a process at the end of a predetermined period. By the use of relays and timers together, entirely automatic control can be provided for almost any process.

The Type TSA-10 timer has two scales, graduated in hours or minutes according to the rating of the timer. One of these scales has a range three times that of the other. This permits a wide range of time-interval selection in a given timer.

The timers are rated one ampere at 115 volts. For applications where the load to be handled exceeds the capacity of the contacts it is necessary to use a magnetic switch in conjunction with the timer. They are available for 60, 50 or 25 cycles, 115 or 230 volts, contacts normally opened or closed, and with time intervals of 5/15, 10/30, or 20/60 minutes.

◆ New Mercury-Switch Thermometer Controller

The use of mercury switches to eliminate open make-and-break contacts controlled by the pen arm is a feature of a new Automatic Control Thermometer announced by The Brown Instrument Company of Philadelphia, Pa. In this new controller, every six seconds a motor-driven control table determines the location of the pen on the chart in reference to the control setting, and tilts the mercury switch from one side to the other if the temperature has changed.

This control mechanism is adaptable to one-, two-, or three-contact control (or signalling) systems. In a two-record controller, each control mechanism can control a separate device, each may be used independently of the other, and each has its own control index.

This new Brown Controller is also supplied as a time-temperature cycle controller. A transparent cam placed over the chart is used to shift the control index in relation to time. As the cam rotates with the chart, the control point is moved to new position, depending upon the shape of the cam. A different cycle of control operations can be obtained by simply cutting a new cam.

All models of this controller are furnished in circular 10-inch or 14-inch dust-proof cases.

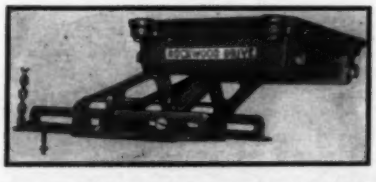
◆ Ceiling Drive Base

A new ceiling drive base that gives to ceiling drives the same range of tension adjustment available in the floor mounting bases has been developed by the Rockwood Manufacturing Company of Indianapolis, Ind.

The ceiling drive base is quite similar to the Rockwood standard base except that it has special hanger arms which suspend the motor horizontally and give greater clearance from the ceiling.

The adjustable steel angles which move horizontally on the hanger arms are supported by a ledge cast on the bottom of the hanger arms. This ledge carries the weight of the motor and takes the weight from the slotted-head screws in the arm slot.

This ledge is important because it not only gives added strength and safety to the motor support, but also permits the



screws to be loosened and the adjustable angles to be moved along the ledge simply by turning the secondary arm-screws while the drive is running, so that one man can quickly make any change in belt tension desired without assistance and without difficulty.

With the new ceiling base, a safety chain which is supplied without extra charge insures that the motor will not fall below its horizontal position even if the belt or fastener should fail.

◆ Constant Level Oil Control

The Lunkenheimer Company of Cincinnati, Ohio, has just developed the "Alvor" Constant Level Oil Control. It is designed to automatically maintain

a constant oil level in ring oiled bearings or anti-friction bearings suitable for oil bath lubrication, and insures against failure of oil supply and consequent costly shutdown of equipment. Waste is eliminated as the Alvor feeds only enough oil to maintain the required level, and as long as any oil shows in the glass bottle none need be added.

This device operates on the liquid seal principle. It feeds only when the oil level in the bearing drops below the end

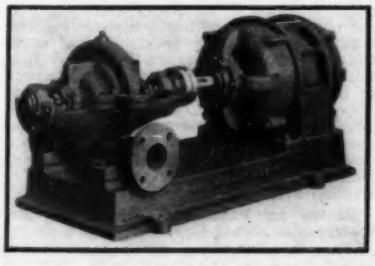
of the shank breaking the liquid seal and permitting air to enter the bottle. It will not feed as long as the oil level is at or above the beveled end of the shank.

The Alvor is illustrated and described in folder F-595 which will be furnished by the manufacturer upon request.

◆ Centrifugal Pump Designed for High Speed

A new line of double-suction split-case pumps specially designed for operation at high speed has been announced by Morris Machine Works of Baldwinsville, N. Y.

These pumps, built in sizes from 1½ in. to 5 in., have been developed to provide a suitable unit for direct connection to electric motors or steam turbines



operating at 3500 r.p.m. They may also be belt-driven or operated through gears by low-speed drivers, such as gasoline engines.

Deep groove, heavy-duty precision ball bearings are used on each side of the pump to take care of both radial and thrust loads, and the bearing supports, bed plate, pump casing, and shaft are all specially proportioned to provide rigidity.

◆ Causes of Priming

Dry steam is the ideal toward which every power plant engineer strives. It is, however, extremely difficult to attain even when superheated steam is used in the system. For not infrequently it will be found that a pipe carrying superheated steam in the upper part will have wet steam or even a film of water in the lower part of the pipe. So-called saturated steam usually contains a small per cent of moisture which is drops of water brought up with the steam bubbles from the boiler or developed by condensation of steam in the pipe. The former is the chief cause and is due to the fact that, as the steam is formed in the boiler, it collects into bubbles of greater or less size and these break through the surface of the water with a small explosive action throwing up little jets of moisture from the surface, some of which is caught in the steam current and carried forward to the piping.

Evidently, in the case of dense water, which has a tougher surface film, these explosions will be more violent because a greater force is required to break through the surface of the water. Hence, we find that a boiler containing a dense water or one in which a considerable amount of mineral matter is in solution is subject to a greater degree of priming than one where the water is clear.

Another cause which will tend to increase the priming is lack of sufficient disengaging surface from which the steam may escape. If there is plenty of surface so that the streams of steam bubbles are not competing for an outlet, there will be less of the explosive action than if there is a violent ebullition. So it is important that in every boiler, particularly if it is to be forced heavily, as is often done in modern practice, there should be plenty of disengaging surface in the steam drum.

Priming caused by dense water can be reduced by blowing down, both from bottom and surface blowoffs, adequate to reduce the density. If the priming is increased by small disengaging surface, the remedy is to carry the water level as low as permissible so as to increase the disengaging surface, and if forcing is responsible, greater boiler capacity must be provided so as to remove the necessity for forcing so heavily.

◆ Organize Millspaugh, Ltd.

W. H. Millspaugh, well-known inventor and manufacturer of papermaking equipment is establishing a new business in England under the name of Millspaugh, Ltd. Recent issues of *The World's Paper Trade Review* have contained interesting details concerning the organization of the company and its plans.

The headquarters of the new company will be at Sheffield, England, at the works of Hadfield, Ltd. This will be the manufacturing center for British and export markets. The steel-making, forging and heat treatment plant at Hadfield's will be utilized and a new plant is being installed to make the largest bronze tubular castings required for the production of papermaking machinery and shipbuilding and engineering trades. Casting machinery for all metals is being installed within Hadfield's open hearth steel plant and a large bronze foundry is being erected in a building adjoining the steel plant. The new company expects to supply the copper bronze and steel engraving rolls to the textile and printing trades.

Mr. Millspaugh is chairman of the board of directors and he is at present in Sheffield supervising construction and installation of the plant. Several years ago he disposed of his interests in the United States and Canada to six large paper mill equipment manufacturers. This equipment had previously been manufactured by the Paper and Textile Machinery Company of Sandusky, Ohio.

◆ Black Clawson Company Is Sixty Years Old

Sixty years ago, Peter Black installed his first roll grinder, hung out a sign announcing a roll-grinding service, and with his son Frank thus founded the business from which has grown that well-known organization of paper machine manufacturers, The Black Clawson Company, Hamilton, Ohio.

The October issue of the company's house organ, *The Messenger*, is an attractive anniversary number and contains an interesting history of the inception and growth of the company. *The Messenger*, by the way, is said to be one of the oldest house organs in America; it has completed 20 years of service in the promotion of the paper mill machinery art.

In 1881, two years prior to the incorporation of the company, it built its first fourdrinier machine which went to the Harding Paper Company, Franklin, Ohio.

In 1926, the operations of the company were increased through the acquisition of The Shartle Brothers Machine Company, Middletown, Ohio. In 1931, Shartle Brothers took over the holdings of The Hayton Company of Appleton, Wis., and moved the equipment to its Middletown plant where Hayton pumps are now made. At present, The Black Clawson Company and Shartle Brothers produce practically all of the major equipment used in paper mills.

H. L. Kutter, who has been associated with The Black Clawson Company for thirty five years has been its president since the retirement of Frank C. Trowbridge as chief executive in 1930.

◆ THE KELPO free-wheeling or one-way industrial clutch has been acquired by the Morse Chain Company, Division of Borg-Warner Corporation. This clutch has been a product of the Kelpo Clutch Company, of Rockford, Illinois. In the future, the Kelpo Clutch will be manufactured at the Ithaca plant of the Morse Chain Company and will be sold by Morse Chain Company representatives. Fred M. Potgieter, formerly president of Kelpo Clutch Company, has joined the Morse organization.

◆ Reunion of Gair "Old Timers"

A first reunion dinner of almost 200 present and former members of the Robert Gair Company, Inc., organization was held Saturday evening, October 21, at the Hotel Pennsylvania. The event brought together many who have served in various departments of the company for long periods of years and others who served in former years on the Gair staff. Former Gair men came from as far off points as Chicago to attend the first reunion dinner.

The event resulted in the formation of the "Gair Old Timers" as a permanent body which plans to hold these reunions annually. The officers elected were: Charles F. Stocker of the Grinnell Lithographic Company, as president; D. B. Hassinger of Hassinger Art Service, vice-president, and Francis Smith, secretary. Members of the board of directors are: P. F. Gaffney of the Densen Danner Company; W. W. Fitzhugh of W. W. Fitzhugh, Inc.; P. L. Andrews of P. L. Andrews and Company; Robert Gair, Jr. of Gair Realty Corporation; Harry C. Campbell of Morris Paper Mills, Chicago; Harold Hughes of Pulp and Paper Trading Company; and A. B. Crowell, E. E. Seaver and Felix Doll of the Gair Company.

◆ Largest Paper Machine for English Mill

According to an announcement published in the November 3rd issue of *The World's Paper Trade Review*, Edward Lloyd, Ltd., newsprint manufacturer of Sittingbourne and Kemsley, Kent have ordered from Messrs. Walmsleys (Bury) Ltd. a news print machine larger than any built previously This machine will have a wire width of 320 inches, will be able to run up to 1,400 f. p. m. giving an output of 1,000 tons a week. There will also be supplied from Bury what is said will be the largest supercalender in the world, having a 310-in. roll.

The machine will be erected at the company's plant at Kemsley. It is not intended to make any additional tonnage of newsprint, but the new machine will replace an old one.

The largest machine at present is at the Great Lakes Paper Co., Ltd., Fort William, Ontario, Canada. This machine has a 302-inch wire.

◆ National Fan Mfrs. Ass'n Opens New Office

The National Association of Fan Manufacturers announce the opening of an office at 5-208 General Motors Building, Detroit, Michigan, for the purpose of coordinating activities under the NRA.

The Association, which has been in existence continuously since 1918, represents through its personnel the major portion of the Fan and Blower Industry.

With this background of experience the Association had available the necessary organization to cooperate with the President in his program.

The new office will be in charge of L. O. Monroe, who has been identified with the industry since 1911.

◆ New Catalogues and Publications

Babcock & Wilcox Co., New York—Diescherized Pipe and Tubing is the title of a new bulletin published by the Babcock & Wilcox Tube Co., Beaver Falls, Pa. It is said to be the first bulletin published on the subject.

L. L. Brown Paper Co., Adams, Mass.—"Facts About Paper Values" is a most attractive brochure just issued by this company. It is designed principally for paper and printing salesmen, and although not being distributed generally, may be obtained through the company's distributors. This booklet is unique in both printing and typography. The first part of this booklet contains a concise description of the natural and unchangeable differences between rag papers and those which are made largely or exclusively from sulphite. Following the fundamental differences between rag and sulphite papers, is a treatment of the distinctive qualities of rag papers made from white linen and cotton clippings and those made from colored rags. The text is simplified by illustrations, including a number of microscopic photographs of fibers.

Crocker-Wheeler Electric Mfg. Co., Ampere, N. J.—In an attractive new booklet just issued, is a brief historical sketch of this company's progress since its inception in 1888. The booklet is devoted to a resume of the various types of motors, generators, motor generator sets., etc., manufactured by this company. The descriptive matter is concise and is illustrated with a large number of halftones.

Falk Corporation, Milwaukee, Wis.—A new bulletin, No. 270, describes this company's line of motoreducers. This bulletin contains descriptive matter on new motoreducers recently added to the Falk line. Diagramatic sketches of the various types are shown in color; there are tables giving dimensional data, and a double-page spread showing motoreducer installations.

Industrial Chemical Sales Co., Inc., New York, N. Y.—An interesting booklet just put out by this company is "An American Story of Precipitated Chalk." The source and manufacture of the company's Snow Top Precipitated Chalk are discussed. There are chapters taking up the chemical and physical tests, density, etc., and the book is well illustrated with photo-micrographs of Snow Top chalks.

Link-Belt Company, Indianapolis, Ind.—Flexible shaft-couplings is the subject of a new illustrated catalogue just completed by this company. Three different types are tabulated and priced, with special emphasis on type "RC" which employs Link-Belt Silverlink Roller Chain. Tables are included for the selection of the right coupling for specific work. Copies sent in response to request on business letterhead.

Lobdell Car Wheel Co., Wilmington, Del.—A revised edition of this company's booklet entitled "Chilled Iron Rolls," first published in 1925, has just been released. Since the first edition was compiled much additional information has become available on the subject of the manufacture, care and conditioning of chilled iron rolls, and while the detailed description of the grinding operation is based upon the use of the Lobdell Type G.H. Roll Grinding Machine, the underlying principles involved apply to all cylindrical grinding operations. Anyone interested in this subject may obtain a copy of the bulletin by requesting same on their letterhead.

The Louis Allis Co., Milwaukee, Wis.—The Engineering Department of this company has prepared a very comprehensive application chart showing 29 different types of electric motors and listing the proper motor for over 50 different standard applications. Charts will be sent upon request to the company's advertising department. The company is also publishing a special magazine devoted entirely to those who are interested in the purchase and maintenance of electric motors. It will be sent gratis upon request.

Morris Machine Works, Baldwinsville, N. Y.—A new bulletin outlines the special problems that are involved in the design and construction of centrifugal pumps for operation at high speed and describes in detail the features of the Morris Pumps that are claimed to solve these problems. There are illustrations including a sectional view of the Morris design. Typical performance curves and a table of ratings and dimensions are also included. Copies on request.

Policyholders Service Bureau, One Madison Ave., New York, N. Y.—This Bureau of the Metropolitan Life Insurance Co. has prepared a report on the subject of Uniform Cost Activities in Trade and Industry. This has been done because of the fact that many business men are giving serious consideration to the need for some plan of uniform cost-accounting and reporting specifically adapted to the problems of their trade and industry as a means of combatting the unsatisfactory conditions that have arisen out of uncontrolled price competition and excessive price-cutting. This report is the result of a review of the uniform cost experiences of more than 76 Trade Associations and also sets forth the opinions and ideas of a number of responsible executives in a wide variety of industries. Copies may be obtained from the Bureau.

T. Shriver & Co., Harrison, N. J.—A publication of merit recently issued by this company is entitled Filter Presses for all Purposes. The booklet presents a clear and concise exposition of the various types of Shriver filter presses, together with a listing of their many applications. The text is amplified by a large number of plates and halftones.

BOOKS

Lockwood's 1934 Directory of the Paper and Allied Trades—The 59th edition of this annual publication has just been received. Due to many changes on account of the present conditions, the book has undergone more than the usual revision. No new mills have been added, but corrections and changes have been brought up to date. Some additions are noted in the Trade Association Section on account of new associations that have been formed. The directory is published by the Lockwood Trade Journal Co., Inc., 15 West 47th Street, New York, and is priced at $7.50.

Adressbuch der Papier, Pappen, und Papierstoffabrieken Deutschlands und seiner Nachbarstaaten (the directory of paper, board, and pulp mills of Germany and neighboring countries)—The 24th edition of this directory is one of the recent publications of Guntter-Staib Verlag of Biberach - Riss, Wurttemberg, Germany. The book, delayed this year because of the depression, lists alphabetically all paper, pulp, and board mills within the various states of Germany and neighboring countries excepting Scandinavia, Finland, Russia, and France. At the same time, the mills are cross-indexed according to names and products. In addition to the addresses of the various mills, information is also given regarding managements, bank connections, installed horsepower, principal machines with productive capacity, watermarks, and trade customs. This volume is priced at 10 Reichsmarks.

Einige in Papierfach schlegende Berechnungen—This is the title of a recent and very interesting little handbook of calculations for the paper trade. Written by Mr. Baudisch, a practical papermaker, it is intended primarily for department heads but might also prove helpful to the management. The author shows how to calculate the number of sheets of different sizes in a roll of paper; how to determine the quantity of raw material required for a certain order; how to estimate the amount of filler required in a furnish to obtain a sheet with a certain ash content; etc. This handbook, priced at one and one-half Reichsmarks, is published by Guntter-Staib Verlag of Biberach-Riss, Wurttemberg, Germany.

The Position and Prospect of the Paper Industry

THE Brookmire Economic Service, Inc., New York City, in a special report dated November 13, 1933 has published the following analysis of the paper industry's position and prospects.

Brookmire Analysis

"The manufacture of paper in the United States in the period since 1920 may be described in the aggregate as an industry in which the physical volume of output had generally trended upward during the prosperous years, but due to increasing production capacity, prices of products had fallen so rapidly as to offset the favorable effects of increased demand. As a result during the major part of the period under review the value of production was able to show only a nominal increase. * * * * *

"The domestic production of newsprint has trended downward since 1926, due primarily to increased imports from Canada. Canadian production of newsprint expanded rapidly between 1920 and 1929 at an annual rate of over 13%, and continued to expand at about the same rate between 1926 and 1929 after the domestic industry had started to recede. Some of the increase in Canadian newsprint import has been due to the development of production facilities in that country by certain large domestic consumers. This together with a general excessive plant capacity has its effect on the prices of newsprint, which have fallen from $70 a ton in 1926 to a current price of $40.

"Producers of newsprint in both U. S. and Canada may find a ray of hope and the beginning of a return to profitable operations, through the formation of a code of fair competition. The details of the plan are not yet formulated, but it is expected that a truce may be arrived at on prices, and those prices should show a substantial increase from those now prevailing. It is highly probable that Canadian producers will cooperate with the NRA in coming to definite solution of this problem, since failure to do so would likely result in an agreement with Soviet Russia to supply a good portion of our wood pulp requirements, and the allotment, or exclusion, of Canadian pulp and newsprint.

"Results of operations so far in 1933 in the Canadian and domestic newsprint industries indicate an increase of 2½% in the output of Canadian mills, but a decrease of 6½% in that of domestic mills. Prices of newsprint in New York over the first nine months this year averaged 21% below the like period last year. It is therefore clear, that while the utilization of newsprint appears to be pointing upward, profits for the current year will be meagre.

"Book paper production in 1933, which accounted for 19% of the value of the paper industry in both 1929 and 1931, it appears will just about equal the volume of 1932. Prices of book paper during the first six months of 1933 were 8½% below that period of 1932. In July these prices rose 5% above July, 1932, while in August a further increase carried them 14% above last year. We believe these prices will at least hold near present levels, and with output for 1933 at about the same level as a year ago, a small rise in the value of output is indicated.

"Book paper production between 1921 and 1929 increased 126%, which next to box-board output showed the largest gain of any of the principal paper products in this country. Since 1929 production of book paper has fallen until in 1932 it was only slightly below the 1920 level, but continued above that of 1921 by 50%. This is a much better record than has occurred in most basic industries.

"Box-board production of 1933, it appears, will be somewhat in excess of that last year, but prices (assuming the remaining months of this year to remain steady) will be 38% higher than those last year. Latest available prices are running 72% above last year. With output a little better than last year's volume and a rise of 38% in prices the value of output will show a similar increase to that of price change. This division of the paper industry should show profitable operation for the current year. The volume of box-board production in 1932 was only 22% below that of 1929, which gives evidence of a shift in usage from wooden to paper containers. In 1921 the box-board end of the industry accounted for 18% of the total value of product. In 1931 it amounted to

FRANK SIMON, dynamic conductor of the ARMCO BAND, heard over the N. B. C. Blue Network at 10 o'clock, Eastern Time, every Friday night.

Expressed in Music

... the Spirit of the

ARMCO MILLS!

★ "ARMCO Iron and Steel Greets You!" With these clarion words of the ARMCO IRONMASTER, the stage is set for another half-hour of radio pleasure over the far-reaching Blue Network of the National Broadcasting Company. ● Every Friday night at ten o'clock, Eastern Time, millions of people gather round their sets for the zestful music of the ARMCO Band—"radio's most popular band." ● When you use ARMCO SPIRAL WELDED PIPE for mill piping, its remarkable ease of installation and free-flowing qualities will be "music to your ears." This custom-made pipe handles surprisingly fast because it is free from dead, useless weight. And yet it is one of the toughest, sturdiest pipes that ever went into a paper mill layout. ● You can buy ARMCO SPIRAL WELDED PIPE from stock in either rust-resisting INGOT IRON or good Armco Steel, depending on the corrosion hazards present. If there is an unusual piping problem involved, call in an experienced "Armco Man" from our nearest office. Otherwise, just send in your order by telephone, telegraph or letter. We'll respond—promptly.

THE AMERICAN ROLLING MILL COMPANY

Executive Offices: Middletown, Ohio

IN TUNE! "The next time I see a piece of Armco metal I will put it to my ear and listen for a song or a symphony which surely must have been rolled into it." CHARLES F. KETTERING

Cut Piping Costs with ARMCO

ARMCO SPIRAL WELDED PIPE

POWER

GENERATION + UTILIZATION + MAINTENANCE

By W. S. JOULE

This section turns the searchlight on power and its allied problems, showing big possibilities to save. Opportunities to improve conditions, methods, apparatus will be discovered. Worth while practices suggest new ideas and wider usages of equipment.

◆ What an Insurance Man Thinks of Plant Cleanliness

The subject of good housekeeping and general plant cleanliness has been discussed in these columns many times. It is, however, a subject that requires constant reiteration, for untidiness seems to be an affliction almost beyond correction in many organizations.

Recently a man in the insurance business made some rather strong observations on this subject and his viewpoints are given hereafter verbatim without further comment.

"I have in mind a plant of some size, located in a paper mill town in the State of Maine. The condition as far as cleanliness went was past description. My business in this plant was the inspection for an insurance company of the mechanical equipment, and I found the job about the dirtiest I had ever tackled, and that's saying something. After spending a week upon this job, however, I began to get interested in it, and the idea came into mind that it might be of some value for me if I made a list of those items that could be improved by cleanliness, in fact, to turn this matter in as a part of my report.

"There were two engines of a well-known make, of a type that has a lot of nickel and brass work upon them. These engines can be made to look pretty nice. There was brass railing all around these units, which had been painted with a heavy tar paint, black and sticky. At the time of my visit, the rails were haired out like a cat.

"There was a small instrument board on which were some 27 instruments of various types, 19 of which were without glass. Practically all of the instruments were nickel-plated, but it was hard work to know it; it could not be told by observation. Half of the instruments were out of order, due wholly to their filthy condition. The floor was hardwood, in very good shape but very dirty.

"The chief engineer's office was enclosed by an all-glass enclosure consisting of 120 panes of glass, of which 78 were broken or out of place. The top of the chief's desk was piled high with magazines, books and catalogs, etc., and just what was there nobody knew, not even the chief, and I do not think he cared. The desk itself was a junk pile, and if the chief wanted a pencil it took at least 15 minutes for him to find it on his desk.

"There was a good bookcase in the office that was given over to forming a receptacle for broken fittings, pieces of scale and other junk. The room itself was half full of junk—2 bbl. of sal soda, two bales of waste, all sorts of broken fittings, and part of a broken pump.

"This was the general condition of everything in the plant. I turned my notes on this matter into the office of our assured and into my own office, and thought no more of the matter. However, about 6 months later the assured sent me a personal letter asking me to make out a report covering exactly what should be done to make conditions cleaner in their plant, and what saving would be made by doing this.

"I made out a list of suggestions from my note book relative to what should be done and sent it to our assured. Six months later I visited this plant, and was informed by the management that the cleaning of the instruments alone had effected a saving that had paid for all the cleaning performed in the plant."

◆ Lubrication of Wire Rope

The importance of lubrication on the life of wire rope is indicated by the fact that in each foot of 1-in. wire rope there is more than 3 sq. in. of frictional surface. It is obvious that the wear on the individual strands as a result of internal friction can be reduced to negligible proportions by proper lubrication. Moreover, wire rope is constantly exposed to corrosion and the lubricant must afford constant protection against such deterioration.

Since lubrication does have such an important bearing on the life of the rope it is advisable to give considerable thought to the selection of the right kind of lubricants. There are a number of excellent commercial lubricants available for this service. An investigation will disclose that these lubricants will measure up to the following specifications which have been compiled by an engineer whose work requires the purchasing of wire rope for various types of service. In his opinion, the following points should be considered in checking qualities of a lubricant for wire rope:

1—It must be soft enough to use in all weather.

2—It must cling to the rope tightly enough that it will never break off or spatter off.

3—It must be impervious to any chemicals which are likely to come in contact with it.

4—It must be of such a character as to lubricate the sheave wheels properly.

5—It must be impervious to water in all forms and of all kinds.

6—It is indispensable that it be free from acid.

7—It must not evaporate.

8—No water should enter into its composition.

9—It must penetrate to the core.

10—It must not decompose under any kind of service.

11—It must not harden or crack at low temperatures.

12—It should be capable of being heated to a consistency permitting its application to the particular service on which it is used.

13—It must not wash off.

◆ Electrically Operated Valves

Electrically operated valves are finding a constantly growing field of application. In addition to the initial installations of these valves in power plants for such purposes as boiler lead controls, for sectionalizing, and for turbine lead valves, electrical operation has now been successfully applied to valves for other special purposes. The practicability of an electrically operated non-return boiler stop valve has been definitely determined and for the automatic maintenance of a pressure differential between two connected headers receiving steam at different pressures, an electrically operated globe valve actuated by a special "U" tube device, appears to possess certain distinct advantages. Additional applications for the advantageous use of valves of this type will, no doubt, be found as the marked utility of electrical valve control becomes more generally known.

◆ TURBINE ACCIDENTS have occurred from leaving tools, fittings, or other objects inside the machine when closing it up after making repairs. In some machines the various parts could not be properly assembled if any sizable object were left inside, but in all of them there will be spaces in which small objects could be left with corresponding promise of trouble, and the possibility of this should be borne in mind whenever turbines are opened up for repairs or inspection.

◆ WHEN TRANSFORMERS are to be operated in parallel, care should be taken to see that they have the same polarity and that they have the same characteristics. To determine whether the polarity of two transformers if the same, connect the corresponding secondary terminals through small pieces of fuse wire and close the primary circuit. If the fuse blows the connections must be reversed; if not, the transformers are of the same polarity.

24%, and constituted the largest division of the paper industry.

"Wrapping paper production for 1933 is estimated, on the basis of operations so far this year, to exceed that of 1932 by 7%. Quoted prices will show little change from those last year and as a result the value of output will show approximately the same increase as that of the volume. Production of wrapping paper rose markedly from 1921 to 1923 on coming out of the 1921 depression, but between 1923 and 1929 it showed practically no gain, and has since fallen back slightly below the 1920 level. This division of the paper industry accounts for 18% of the value of production. It accounted for the same proportion in both 1921 and 1929.

"Writing paper in 1931 accounted for 12.3% of the value of product in the paper industry. This compares with 10.5% in 1921 and 12.5% in 1929. The domestic output of writing paper was very similar in movement to that of wrapping paper in the early 1920's, showing a marked increase from 1921 to 1925; steady thereafter until 1929, and falling during the next three years until in 1932 it had returned to a level between that of 1920 and 1921. Estimated output of writing paper for 1933 indicates an increase of 9% over that of 1932. This will also be the approximate increase in the value of production for average prices as now indicated point to about the same level as a year ago.

PAPER PRODUCTION U. S.
(Thousand Short Tons)

	Book	*Boxboard*	*Newsprint U. S.*	*Newsprint Canada*	*Writing (fine)*	*Wrapping*	*All Paper*
1920	1,104	....	1,512	875	389	832	6,399
1921	726	1,222	1,225	808	242	652	4,913
1922	982	1,773	1,448	1,080	361	836	6,633
1923	1,122	2,046	1,485	1,266	376	1,024	7,140
1924	1,231	2,228	1,471	1,353	370	1,016	7,427
1925	1,284	2,373	1,530	1,522	449	1,087	7,921
1926	1,346	2,529	1,677	1,878	459	1,075	8,320
1927	1,332	2,477	1,485	2,082	447	1,087	8,026
1928	1,507	2,753	1,409	2,382	459	1,123	8,479
1929	1,635	2,952	1,387	2,727	468	1,067	8,735
1930	1,370	2,701	1,284	2,498	422	961	7,789
1931	1,318	2,557	1,160	2,188	355	877	7,178
1932	1,090	2,150	1,008	1,919	317	739	6,172
*1933	1,075	2,200	900	2,000	340	790	6,250

*Estimated.

"In conclusion, the paper industry in all its departments has shown a demand that has been more stable than that of most basic industries. Adoption of a fair practice code and diminution of prevailing cutthroat price tactics will in our opinion return this industry's operations to a profitable basis. A greater degree of cooperation both in prices and in allocation of markets between Canadian and domestic producers can be looked for. In contrast with the chemical industry, or the steel industry, whose prices for years have been subject to a greater degree of cooperation; the paper industry will be benefited to a larger degree by price control than perhaps any other industry with the exception of the oil industry. * * *"

◆ ◆ ◆

◆ Chemical Society Offers New Membership

For the purpose of bringing younger chemists and chemical engineers interested in industrial chemistry into touch with the work of the Society, the Society of Chemical Industry, 305 Washington St., Brooklyn, N. Y., has established a new form of associate membership, similar to the junior membership in other societies.

To be eligible for associate membership, the applicant must be under 23 years of age, and when the member reaches that age, his associate membership is automatically terminated.

The subscription for associate members is $1.90 per year. Membership applications may be obtained from the Brooklyn office.

◆ R. W. VAN PEENAN and R. J. Brown of Kalamazoo, Mich., have recently been granted a patent on a metal core plug which is claimed to be superior to wooden core plugs due to the fact that they are uniform in size and shape, and will, therefore, not shrink or warp. The cost is said to be no more than that of wooden plugs. These plugs are being manufactured by R. W. Van Peenan of Kalamazoo, and marketed under the name of "Alsteel" Roll plugs.

ASK FOR THIS BOOKLET!

• It contains the complete story of The Harvey-Lewellen Automatic Paper Thickness Control . . . told in an interesting and informative way . . . specially prepared for mill executives.

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BLEACH TANK WHITE will actually protect metals from corrosion and make unnecessary the immediate replacement of metal parts which may be causing poor quality pulp. Acid and alkali proof.
Dries by evaporation in a few minutes, can be applied over damp surfaces and becomes very glossy when dry.

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The Paper Industry Safety Contest

July 1, 1933 to June 30, 1934

Scores as of October 31, 1933 (Cum.)

21 Perfect Scores

PERFECT SCORES

Division I—Paper and Pulp Mills

	PARTICIPANT	MILL	LOCATION
GROUP A	Hollingsworth & Whitney Co.	Algonquin & Taconnet	Winslow, Me.
GROUP B	Kimberly-Clark Corp.	Niagara	Wisconsin
	St. Croix Paper Co.	Woodland	Maine
GROUP C	Bryant Paper Co.	Paper Div.	Kalamazoo, Mich.
	Consolidated Water Power & Paper Co.	Appleton	Wisconsin
	Eastern Mfg. Co.	Katahdin	Lincoln, Me.
GROUP D	Upson Company	Lockport	New York
	Hollingsworth & Whitney Co.	Aroostook & Cobbassee	Gardner, Me.
	International Paper Co.	Continental Div.	Ashland, N. H.
	Bird & Son, Inc.	Roofing Plant	Chicago
	International Paper Co.	Livermore	Maine
	International Paper Co.	Riley	Maine
	Hollingsworth & Whitney Co.	Abenaquis	Madison, Me.
	Spaulding Fibre Co., Inc.	New Mill	Milton, N. H.
	Spaulding Fibre Co., Inc.	Hayes	No. Rochester, N.H

Division II—Remanufacturing

Bryant Paper Co.	Imperial	Kalamazoo, Mich.
Container Corp. of America	Anderson	Indiana
Container Corp. of America	Natick	Massachusetts
Texas Corrugated Box Co.	Dallas	Texas
Southern Container Co.	Houston	Texas
Bemis Bro. Bag Co.	E. Pepperell	Massachusetts

IMPERFECT SCORES

	Key	Rank	Points Credit	Points Debit
GROUP A	PB- 9	2	928.910	
	PA-17	3	898.542	
	PA- 6	4	822.490	
	PA-11	5	748.888	
	PB- 5	6	678.654	
	PA- 5	7	632.104	
	PA- 1	8	605.410	
	PB-15	9	563.402	
	PA- 4	10	530.024	
	PA- 3	11	471.440	
	PA- 8	12	451.046	
	PB- 8	13	416.344	
	PA-16	14	396.766	
	PA-14	15	295.850	
	PB- 2	16	72.376	
	PA-12	17		238.296
	PA-13	18		263.622
	PA-15	19		273.658
	PA- 9	20		506.876
GROUP B	PC	3	868.834	
	PB	4	704.454	
	PB	5	684.242	
	PB	6	652.448	
	PB	7	502.338	
	PB	8	378.494	
	PB	9	259.406	
	PC	10	248.166	
	PB	11		27.234
	PC	12		64.242
	PB	13		246.570
	PC	14		383.136
	PB	15		862.656

	Key	Rank	Points Credit	Points Debit
GROUP C	PC-25	4	808.736	
	PC-15	5	793.286	
	PD-28	6	780.186	
	PC-11	7	668.619	
	PC-14	8	614.060	
	PB-10	9	397.936	
	PC- 3	10	258.526	
	PD-17	11	231.974	
	PC-21	12	208.958	
	PD-25	13	177.124	
	PC-12	14	167.838	
	PD-13	15	130.130	
	PC- 4	16	116.690	
	PC- 8	17		12.798
	PC-23	18		94.036
	PC-19	19		155.464
	PC-27	20		181.488
	PC- 9	21		222.898
	PC-13	22		504.088
	PC-26	23		999.410
	PB-18	24		1,440.656
GROUP D	PC-20	10	692.362	
	PD- 3	11	682.558	
	PD-27	12	661.846	
	PD-26	13	561.704	
	PD- 9	14	521.910	
	PD- 1	15	404.558	
	PD- 7	16	88.400	
	PD-14	17		383 120
	PD- 8	18		1,400.178
	PD-29	19		2,545.728
	PD- 2	20		2,966.186

DIVISION II

RC-5	7	512.706	
RD-4	8	463.866	
RC-2	9	402.522	
RD-6	10		84.226
RD-7	11		1,735.346

No October Report: PA-7; PA-10; PB-12; PC-5, PC-16; PD-20; RA-1, RB-1, RD-5.

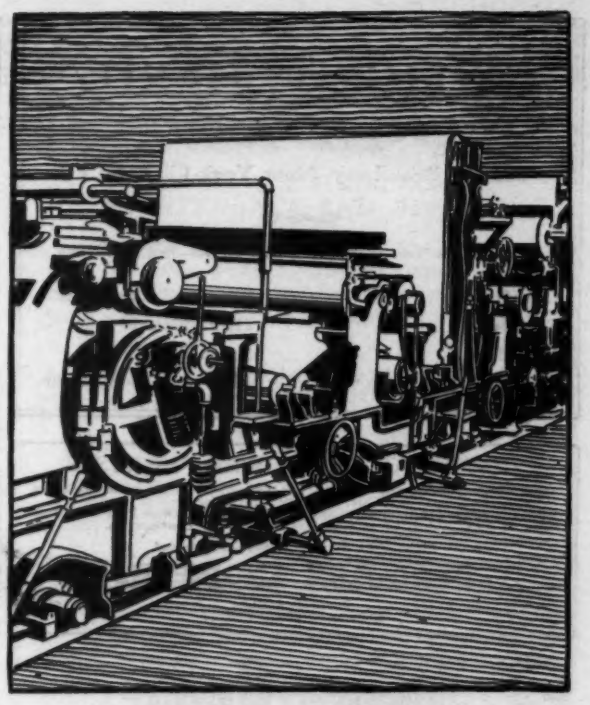
No September or October Report: PD-11, PD-12.

Withdrawn: PC-17; PD-21; PD-22, PD-23; RC-3.

♦ Important Change in Safety Contest Awards

Those mills that are participating in the contest conducted among the members of the Paper and Pulp Section of the National Safety Council will be interested in an announcement made by the Council respecting awards to be given in future contests.

Word has been given out through the Executive Committee of the Council that hereafter all contestants completing the contest with a perfect record, regardless of man-hour ex-



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Orrs are also unexcelled for their water-removing qualities.

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Boilers • Engines • Pumps
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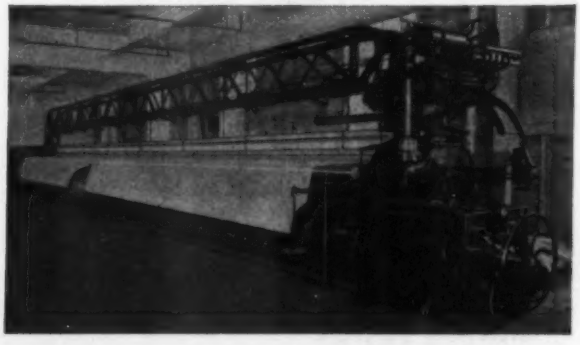

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Now we offer these same quality felts made endless in all sizes up to 100 feet long, made on the latest type, wide felt loom built.

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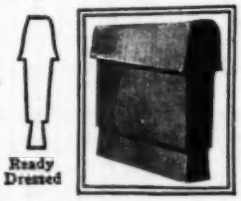
THE MOST ECONOMICAL FILLING THAT CAN BE PUT IN A MORTISE WHEEL



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posure, will be given equal awards, providing, of course, that all other conditions set forth in the rules have been complied with.

It is the thought of the National Officers of the Council and its Executive Committee that this will further stimulate interest in accident prevention, as well as the contest itself; also that since nothing can better perfection, it is only proper that the management and employees of such units be recognized and rewarded for their meritorious achievement.

◆ DUE TO RENEWED interest in public building projects in line with the government program of industrial recovery, the Third International Heating and Ventilating Exposition, to be held at Grand Central Palace in New York City, February 5 to 9, inclusive, 1934, is receiving considerable attention. The exhibitors include leading industrial organizations showing the latest equipment for heating, ventilating and for air-conditioning.

◆ Carbon & Carbide Honored for Chemical Progress

In May, 1933, the *Chemical and Metallurgical Engineering* sponsored and launched the idea for an award to give public recognition to the company in the chemical industries that through the effective use of chemical engineering in any phase of its activity has contributed the most meritorious advances to the industry and profession since 1930, or during the past three years of the depression.

More than 20 nominations for the new award were received and considered by the committee which had been picked from men recognized as leaders in the industry and profession. From these nominations, the Carbide and Carbon Chemicals Corp. received the highest rating and was accordingly declared the winner of the award. This corporation is one of the largest and most outstanding chemical manufacturers in the world, and since 1930 has developed and put into commercial operation a number of processes for chemicals for which American industry was previously dependent upon either fermentation or other non-synthetic sources.

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Bars, Shapes	Nails, Wire	Refined Iron
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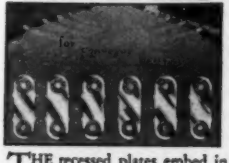

ELEVATORS

THE recessed plates embed in the belt and compress it instead of pulling against the bolt holes. This provides great surplus strength. It equalizes the pull throughout the plies. Keeps belt ends intact avoiding trouble. FLEXCO HD Belt Fasteners are in extensive use throughout many industries, giving long reliable service wherever tight butt joints are desired. Made in steel and in monel metal. Sold by jobbers and belting houses in 5 sizes. Recommendations supplied gladly

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SHAF-TITE LIGHT WEIGHT LENGTHENS FELT LIFE

The Shaf-tite cap on Rodney Hunt rolls is a steel stamping—not a heavy casting. Felts wear longer because Shaf-tite lightness puts less weight on bearings, makes less resistance to turning.

We will send free sample Shaf-tite Wood Felt Roll at your request. See how Shaf-tite construction ends roll troubles. Address 73 Maple Street.

Shaf-tite Rolls are positively the lowest-priced quality rolls on the market. Mass production methods — Rodney Hunt is the world's largest roll maker — permit many savings that cannot be made by the other roll builders.

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Wood, Metal, Rubber-covered, Etc.

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For
IMMEDIATE SHIPMENT

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Barium Chloride	Salt Cake
Barium Sulphate (Blanc Fixe)	Soda Ash
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TECHNICAL DEVELOPMENTS

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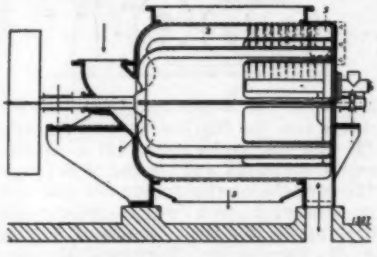
IN THE PAPER INDUSTRY ■ DOMESTIC AND FOREIGN

◆ New Screening Drum

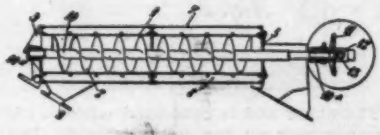
This is particularly for use in mechanical wood pulp mills. The wood pulp enters at one end as shown by the arrow in the accompanying illustration and is seized by vanes (1) and distributed over the circumference of the drum. The vanes (2) give it a screw-like motion. The pulp is not impacted at all. Centrifugal force causes the fines to pass through the screen and they are removed through the outlet (3). The coarser fibers and splinters slide along the screen and are finally discharged through the outlet (4). The most important feature of the operation of this screening drum is the movement of the stock in a spiral path over the drum. The splinters and the coarse fibers take positions in the direction of the flow of the stock under these conditions, and since they cannot pass through the openings in the drum, they move forward along its surface until they are freed from the adhering fine fibers and are finally removed. Screening is thereby claimed to be highly effective and power



consumption per ton of pulp treated is low. Furthermore, the splinters and coarse fibers do not clog up the perforations and there is no danger of the screen breaking due to the accumulation of large quantities of the coarse fibers thereon. G. Antonoff. Wochenblatt fuer Papierfabrikation, volume 64, 1933, pages 242 to 243.

◆ Pulp Thickener

The pulp is passed through a drying apparatus. The latter consists of a cylinder into which the pulp is introduced at one end, a screw conveyor or the like arranged in this cylinder and means for maintaining the conveyor revolving at a certain speed which is sufficient to allow a flow of pulp out of the exit end of the cylinder at a speed less than the speed of the pulp entering the cylinder. Features of the design of this apparatus are variable inclination of the cylinder and a series of perforations in its periphery, a wall located at the end of the cylinder at which the pulp emerges, this wall being movable, an annular jacket surrounding the cylinder, and means for providing the production of a partial vacuum in that jacket. A sectional view of the apparatus is illustrated. The radially perforated and inclined cylinder is shown at (1) and the screw conveyor at (2). The dilute pulp is fed into the cylinder through the opening (3) in such a manner as to force the pulp to become dried (without the use of heat) against the perforations of the cylinder. The dried



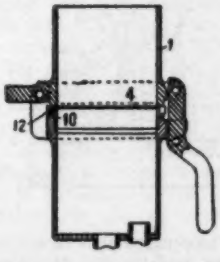
material is removed through the other end of the cylinder. The contact between the walls of the cylinder and the screw conveyor blades is such that these walls are constantly cleaned thereby so that there are no accumulations. An elastic wall (5) closes the inner end of the cylinder. The push of material against this closure forces it open and then it closes automatically, so that the required pressure conditions are maintained in the cylinder. A jacket (7) surrounds the cylinder (1) to form an annular chamber (8) for receiving the evacuated liquids. An orifice (9) is located at the lower end of the chamber. The shaft (10) of the screw is driven by means of gear connections as shown in the illustration. Societe Pressoirs Colin. French Patent No. 748,688.

◆ Sulphur and Ash Content of Sulphite Pulp

Composition of the ash from various unbleached and bleached sulphite pulps was determined. It was found that before bleaching the ash consisted substantially of lime. Calcium sulphate was present only in the proportion of 10 to 25 per cent., while the percentages of the remaining impurities in normally digested pulp were very markedly reduced. The major part of the lime, as found, was combined with lignin-sulphonic acids. These acids and their salts are very difficultly soluble in water and possess base-exchanging properties. Their quantity forms a certain ground for the degree of decomposition of the stock. There is another relation between the degree of decomposition of the stock and the sulphur content. The calcium sulphate, which is substantially soluble in water, does not form the principal ingredient of the pulp ash, which is to be expected in view of the large quantity of water used in preparing the pulp. Nevertheless, certain proportions of calcium sulphate are present in the pulp, and the salt is not present in the ordinary dehydrated form but in the difficultly soluble anhydride form, in which calcium sulphate separates from the aqueous solution at temperatures over 130 degrees C. Conditions are different with bleached pulp. In this case the ash consists almost entirely of calcium carbonate, inasmuch as the hypochlorite is completely destroyed in exhaustive bleaching of ligin-sulphonic acids. Water-soluble calcium sulphate is also formed. The content of carbonate in the ash is very strongly reduced by after-treatment with acid. These investigations were very much facilitated by a new method for determining sulphur. While considerable quantities of sulphur dioxide are evolved during the ordinary ashing of the pulp sample, wet combustion by means of sodium hypochlorite allows accurate determination of the total sulphur in the form of barium sulphate. When the content of calcium sulphate is determined separately, then it is possible to calculate the proportion of sulphur combined organically. F. Schuetz and W. Klauditz. Der Papierfabrikant, volume 31, 1933, pages 123ff.

◆ Making Paper Sample

The apparatus, used for this purpose, is shown in the accompanying illustration. The upper part of the apparatus (1) rests on a screen (4) and on a rim (12). The screen is fastened tightly between this rim and the ring (10).



When the upper part (1) is lifted, the screen on which the sample of paper or cardboard has been formed can be removed. Linkoepings Armatur och Metallfabriks Aktiebolag, Sweden. Swedish Patent No. 76,250, November 28, 1928.

◆ Acid Formation in Sulphite Digestion

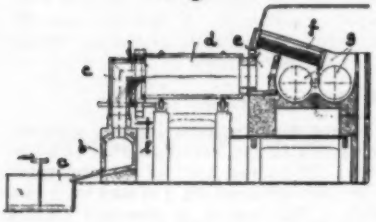
A very thorough investigation was made into the danger of the formation of hydrochloric acid during the digestion of wood with sulphite liquor. It was found that the optimum salt concentration corresponded to 0.02 per cent hydrochloric acid in the digestion acid. This is the maximum limit and any

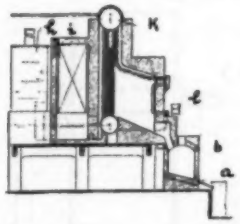
addition of salt above an amount equivalent thereto will have a very bad action on the strength of the pulp fibers. The injurious action of sea water on pulp made from wood which has been flotated down the sea or other body of salt water to the mill can be overcome to a certain extent by stopping the digestion of the wood in the case of the manufacture of easy-bleaching sulphite pulp so that pulp is obtained with a higher than normal content of lignin. This holds good nevertheless only to fourteen per cent bleachability. Belani. Angewandte Chemie, volume 45, pages 699ff.

◆ Alkali Recovery and Soda Furnaces

A number of technical improvements relating to the recovery of alkali in soda pulp and sulphate works are described. Recovery of heat as well as alkali values are emphasized. An installation for this purpose is shown in Figure 1. The soda dissolver is shown at (a), the melting furnace at (b), the gas inlet at (c), the rotary furnace at (d), the combustion chamber at (e), an auxiliary boiler at (f), the disc evaporator at (g), the scrubber at (h), the economizer at (i), the steam boiler at (k) and the conveyor at (h). It was found in operating this installation that in spite of a heat load of 50 to 70 kilograms per square

Fig. 1.





meter of heating surface in the auxiliary boiler, the load on the disc evaporator could be increased, the heat present being sufficient therefor. There is no difficulty in cleaning out the auxiliary boiler. Sulphate dust is given no opportunity of collecting in the latter but accumulates in the black liquor. The disc evaporator takes over a part of the work usually performed by the rotary furnace. Hence the liquor is concentrated to a high degree. Not only is the calcined material dried in the rotary furnace, but a partial carbonization also takes place and also combustion. In this installation approximately 60 to 70 per cent of the black ash from the rotary furnace is burnt in the melting furnace. Figure 2 shows the arrangement used in the rotary furnace for the introduction of air required for the combustion. The spherical lower end of this device dips into the calcined or melted mass.

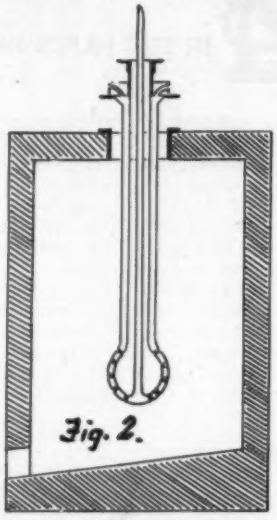


Fig. 2.

The upper end is connected with an air compressor or fan. W. Schmid. Der Papier-Fabrikant, 1933, volume 31, pages 245 to 248.

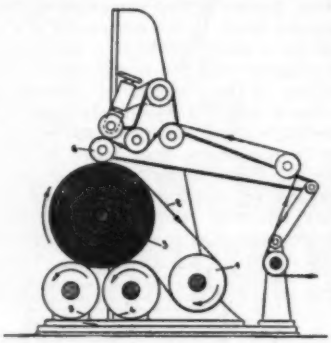
◆ Handling Badly Odorous Gases

In one Swedish sulphate mill a drying tower filled with sawdust soaked with water and also wood chips which are later to be digested is used. The greatest part of the moisture is removed by passing through the very hot gases from the soda furnaces. The water vapor which emerges from the tower and its condensate are very acid at the start (the acidity corresponding to four grams of sulphuric acid per liter). This is an indication that large quantities of gaseous sulphur compounds are going to waste. The wood itself in the tower may be able to absorb a certain proportion of these compounds and may then react acid. Hence, provision must be made for giving the wood an alkaline reaction, which is done by irrigating the tower with black liquor by means of spray nozzles located at definite points. This treatment results within a short time in a higher sodium sulphite content of the digestion liquor. It is claimed that when the gases are treated by this process the bad odor is absolutely destroyed. The odorous components of the black liquor are removed effectively in the tower due to the intimate contact between the black liquor and the gases from the soda furnaces.

Another method proposed for the removal of the odors from the waste gases in sulphate mills and also for reduction of the loss of alkali consists in cooling the gases and saturating them to the dewpoint with water and then conducting them through an alkaline liquid containing dissolved or emulsified hydrocarbons belonging to the terpene or camphor group. One particular feature of this process is that it allows sufficient time for the treatment of the gases. It was found that the normal speed of about four meters per second at the base of the stack and the usual time of about half a minute for the flow of the gases from the melting furnaces through the rotary furnaces and the disc evaporator to the open air was much too short. The speed of the flow of the gases in the new process is approximately half a meter per second. Anonymous. Wochenblatt fuer Papierfabrikation, 1933, volume 64, pages 257-8.

◆ Winding Machine

A guide roller (1) is arranged in such manner that the paper web (2), after it has passed by the pressure roller (6), begins to wind up on a roll carried by the carrier rollers (4) and (5). The pull on the paper web is carried over by the guide roller (1) to the point of contact between the web roller (3) and the supporting roller (4). The paper is wound up by this device at a very high speed without any noise. Furthermore, the guide roller (1) is arranged between the pressure roller (6) and the supporting roller (4), that the paper or cardboard web (2) makes contact with a considerable part of the circum-



ference of the carrier roller (4). The result is that the friction between the web (2) and the carrier roller (4) is considerably increased and sliding of the web (2) over the carrier rollers (4) and (5) is prevented even when considerable braking is applied. Jagenberg Werke A. G., Duesseldorf, Germany. German Patent No. 572,679.

◆ Effect of Wood in Sulphite Digestion

While the wood is carefully selected for sulphite digestion, any kind of wood has been considered satisfactory for sulphate digestion. Experiments were accordingly carried out to determine the effect of the wood substance on the sulphite digestion, these experiments being carried out under conditions as close as possible to those existing in the plant. The specific gravity of the wood was determined as well as the conditions under which it grew, the composition of the fibers, the resin content and lignin content as well as the pulp yield. The quality of the pulp was also tested. Wood from the red pine *(pinus sylvestris)*, one meter from the ground, was found to give pulp of greater mechanical strength (braking) but less tearing strength than pulp from wood taken

from the tree 10 meters from the ground. The specific gravity of the wood of the first sample is less than that of the wood in the second sample. Pulps were also obtained from red pine of good or fair quality, of wood of *pinus abies* of good quality, of pinewood in dry state and in state of partial decomposition and also of wood partially destroyed by fire. Various results were obtained. For example, partially decayed wood gave a poor pulp of small mechanical strength while the wood damaged by fire gave a bad pulp. Resistance to tearing is most affected by the quality of the wood and of its fibers. It is likewise affected by the specific gravity of the wood and by the percentage of wood cut in the autumn. Increase of the specific gravity and of the percentage of the wood cut in the autumn increases the resistance of the pulp obtained from it to tearing. D. Johansson. Svensk Pappers.-Tidn., 1933, pages 137 to 155.

◆ Making Dispersions

The apparatus, shown in the accompanying illustration, is used for the purpose of producing dispersions of paraffin wax and the like for use in coating paper, cardboard and the like. In this apparatus the atomizer (A) is fed with compressed air through the pipe (a), while the pipe (b) dips into the bath containing a substance in the liquid state. This applies particularly to papaffin wax (B), which is maintained in the liquid state by steam flowing through the coil (C). Above the atomizer is located at a convenient distance the object (P) which is to be covered with the liquid wax. Com-

Fig. 1

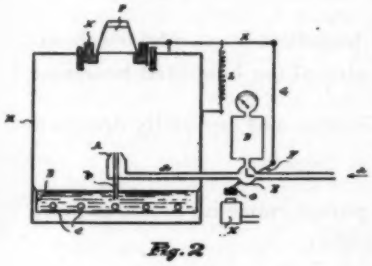


Fig. 2

pressed air forces the wax against this object, the wax adhering thereto in the form of fine drops. The quantity of wax applied to the paper or cardboard depends on the pressure of the compressed air, the duration of atomization. The quantity of air used may be regulated by means of a valve which opens and closes alternately, but this device is not reliable. In the new apparatus the air passes through a two-way valve (E), communicating with a pressure vessel (D). In the position shown in Figure 1, compressed air enters the vessel and the entrance to the atomizer is closed. This is non-operating position. The position of the valve in the operating position is shown in Figure 2. The flow of compressed air to the container (D) is closed, while the air from the latter is allowed to enter the atomizer (A). The valve (E) may be manipulated by hand or automatically. The movement of the paper or cardboard web (P) in the guides (K) is mechanically connected with the valve (E), by means of the levers (F), (G) and (H). Societe Papeteries Navarre. French Patent No. 750,036.

◆ Sizing Paper With Waxes

Emulsions of waxes, etc., which do not flocculate when diluted with hard water but which are readily precipitated with substances like alum, are obtained by using a monocarboxylic acid ester of a polyglycol as an emulsifying agent. The acid value of the sizing agent should be not less than 2 and not greater than 40. For example, carnauba wax (acid value 2) is used in the proportion of 50 parts by weight with 6.5 parts by weight of polyglycol oleic acid ester and 30 parts by weight of water. The mixture is heated with stirring and then treated with 20 parts by weight of 2-normal solution of potassium hydroxide. Paper, which is sized in this manner, that is, with two per cent. carnauba wax, are photographically inert and, therefore, particularly well suited for use as protective paper for photographic films, etc. I. G. Farbenindustrie A. G. Frankfurt-am-Main, Germany. British Patent No. 395,155.

◆ Drying Paper on Paper Machine

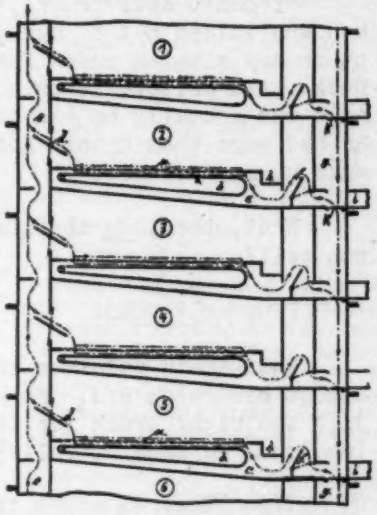
A study has been made of the mechanism of the processes by which the water is removed from paper on the felt-covered drying cylinders in the paper machine. Methods were described for measuring the thickness, porosity, and air-permeability of felt materials and these properties were defined. The air-permeabilities of cloths, which are composed of cotton, wool, asbestos, sailcloth, and cotton-asbestos mixtures, are compared. The effects of the above properties on the water-absorbing capacity of the felts and the dependence of the drying of the paper web on both evaporation and the capacity of the felts to absorb water are discussed. W. Mull. Der Papier-Fabrikant, volume 30, pages 701-4, 725-29, 737-42.

◆ Bleaching Wood Pulp

The pulp is systematically treated in countercurrent flow with bleach liquors of increasing concentration in active chlorine. The used bleach liquors are allowed to act on less strongly prebleached pulp and finally on the unbleached pulp in accordance with the decrease in their active chlorine content. Each bleach liquor is removed by suitable means after a given time of action on the pulp. The temperature of the separate bleach liquors is simultaneously decreased with rising concentration so that the weakest bleach liquor has the higher temperature (for example 25 to 35 deg. C.), while the strongest bleach liquor is used at a temperature of 15 to 25 deg. C. I. G. Farbenindustrie A. G. German Patent No. 570,018.

◆ Knot Catcher

The new knot catcher is made in the form of chambers superimposed one on the other. This saves considerable room and also affords the possibility of cutting out one or more of the chambers from operation when necessary, without interfering with the operation of the machine as a whole. The chambers are shown numbered (1), (2), (3), (4), (5), etc. in the order in which they operate. Each closed chamber contains a slotted plate (a). The suction or pressure boxes are shown at (c). The parts (b) are located in these boxes and due to the increase and decrease of the volume of the former the mixture of water and pulp is forced through



the slots of the plates (a) and forced out again. The flaps (d) control the flow of stock into the chambers. The stock flows into the apparatus and the chambers through the shaft (e), while the flaps (f) control the level of stock in the chamber and the exit of the same therefrom. The fine stock is collected in (g) and the coarse stock run out through the channel (h). The direction of flow of the stock through the apparatus is indicated by the arrows. German Patent No. 569,662. Otto Schumann, Dresden.

◆ New Digester Mortar

The new product is known as asplit. It is practically impervious to liquids, in contradistinction to all known silicate mortars or cements which remain porous to a certain degree. Resistance to pressure is 800 to 1,000 kilograms per square centimeter, which is four to five times as great as that of the best water glass cement. Asplit cement is also resistant both to acids and alkalies. It is non-poisonous as compared with litharge-water glass cements. Practical tests have been made with it and results were good. Dr. Dietz. Wochenblatt fuer Papierfabrikant, 1933, volume 64, page 176.

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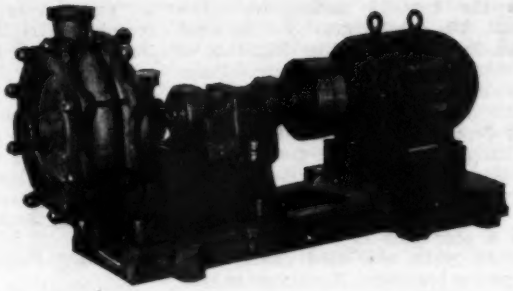

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The COMMERCIAL OUTLOOK

New York, December 1, 1933.

WHILE it can hardly be said that the situation in the paper manufacturing industry has shown much change during the past month, from a production or sales standpoint, there is on all sides within the industry an improved sentiment clearly evident. What this is based on or what is the reason for it is hard to determine unless it is a part of the more confident feeling existing generally among manufacturers and merchants—a belief that business is on the threshold of another spurt of activity such as was experienced last summer, a period of broader demand, increased manufacturing output, and greater enthusiasm and optimism concerning business in general. In short, there has been within the last fortnight a marked gain in confidence throughout trade circles regarding the immediate business situation, and this confidence apparently is crystallizing into a common belief that a pick-up in commodity, as well as financial, market activity is imminent.

Meanwhile, demand for the various classes of paper is at least holding its own. The market is registering moderate life, though moderate only; some mills and more especially those which cater largely to consumers who acquire their bulk supplies of paper on contract are fairly busy, whereas others are not so well engaged and are on the lookout for additional orders. From an aggregate standpoint, there is no question more paper—by an appreciable margin—is being produced and marketed and consumed than during the earlier portion of this year; in other words, paper manufacturers are enjoying a much larger volume of business than during the first half of the current year. At the same time, it is generally stated that demand has simmered off from the high level of the recovery witnessed about two to three months ago. Just what is ahead for the industry is more difficult than ever to perceive, but certainly prospects are encouraging, and the fact that a great majority in the industry are possessed of so pronounced a degree of optimism regarding the outlook would seem to foreshadow better things for the paper producer and distributor.

Consumption of paper, of nearly every kind, is on the rise. There are evidences of this on all sides. Newspaper publishers are printing larger issues, which means they are using more newsprint, and this fact is substantiated by statistics which show production of print paper has increased on the North American Continent compared with last year while mill stocks have undergone a decline. Magazine and periodical publishers have increased their consumption of book paper appreciably; with general business improved there is a larger consumption of fine paper for correspondence and advertising purposes; more wrapping and tisue paper is being consumed, and now that the building construction movement is getting under way, larger amounts of sheathing and roofing papers will go into consumption. An analysis of the paper market situation just issued by one of the leading economic services states that the utilization of newsprint appears to be pointing upward and that production of this important class of paper will record some gain this year over 1932, that book paper output will fully equal that of last year, that wrapping paper production will exceed that in 1932 by 7 per cent, that the production of writing paper will be 9 per cent over a year ago, and that boxboard output will be above that of last year.

The survey above referred to concludes with these significant assertions: "The paper industry in all its departments has shown a demand that has been more stable than that of most basic industries. Adoption of a fair practice code and diminution of prevailing cutthroat price tactics will in our opinion return this industry's operations to a profitable basis. A greater degree of co-operation both in prices and in allocation of markets can be looked for. In contrast with the chemical industry, or the steel industry, whose prices for years have been subject to a greater degree of co-operation, the paper industry will be benefited to a larger degree by price control than perhaps any other industry with the exception of the oil industry."

Production of newsprint in the United States in October amounted to 82,052 tons, compared with 72,907 tons in the month preceding and 76,731 tons in October last year, while Canadian output was 191,452 tons, against 179,416 tons in September this year and 157,506 tons in October a year ago, the October production of both countries representing an increase of 8.4 per cent above September of this year, and 16.7 per cent higher than in October a year ago. During the first ten months of the current year, Canadian output increased by 33,907 tons, or 2 per cent, while the United States output decreased by 66,739 tons, or 8 per cent. October shipments from United States mills were 81,580 tons, contrasted with 75,008 tons in September and 76,922 tons in the corresponding month last year, and from Canadian mills 190,326 tons, against 183,971 tons in September and 157,568 tons last year. Stocks of newsprint at United States and Canadian mills at the end of October totaled 57,406 tons, compared with 55,808 tons a month before and 81,201 tons at the same time a year ago according to News Print Service Bureau statistics.

The International Paper Company has sent notices to its newsprint contract customers informing them there will be no change in the net cost of their paper before April 1, 1934. Any later change "will be made only after careful consideration of conditions prevailing in the paper and publishing industries." The notice means no change in the contract basis on newsprint, now $40 a ton for New York and Chicago, is in contemplation prior to April 1 next.

Prices of paper in general are exhibiting steadiness. Book, wrapping, writing and other grades are quoted firmly by manufacturers, who are adhering to quotational levels. Boxboard prices are maintained in the face of a distinctly quieter market, mills in the East quoting $45 a ton for filled newsboard delivered in New York City, and $42.50 for plain chipboard.

◆ ◆ ◆

◆ Rosin Solutions For Sizing Paper

A study has been made of the dissolution of rosin in alkali, particularly in sodium hydroxide. Rosin is peptized in sodium hydroxide by the formation of molecularly-dispersed sodium abietate. The amount of dissolution is greatest when moderate amounts of the solid phase are present and the maximum thus reached is the higher, the more concentrated is the sodium hydroxide. In highly concentrated solutions the sodium exerts a coagulating influence. A maximum solubility is also observed when the amount of the solid phase is kept constant and the amount of sodium hydroxide is varied. Increase of temperature has little influence. The amount of rosin peptized also depends on the way in which it is added. In general less dissolves when it is added in small portions. These phenomena are correlated with other examples of dissolution-peptization which show variation of behaviour according to the solid-haserule. W. Gamm Kolloid Zeitung, 1933, volume 62, pages 180 to 198 and 199 to 202.

◆ Making Carbon Paper

Two kilograms of crystal violet are added to a melted mixture of six kilograms of cetyl alcohol and two kilograms of carnauba wax. The mixture is heated and agitated until solution is complete. Then two kilograms of sesame oil are added and the mixture is filtered. The application of this mixture to the paper base is carried out in the usual manner. The feature of this process is the use of cetyl alcohol which is claimed to give a carbon paper of unusual qualities. Unichem Chemikalien Handelsgesellschaft A. G., Switzerland. French Patent No. 744,832.

Domestic RAW MATERIALS

◆ Papermaking Rags

Raw material markets, with the exception of wood pulp and chemicals, continue much in favor of paper manufacturers, which is to say that practically all grades of secondary material which paper and board mills consume are in ample supply to satisfy consumers' present wants and are being purchased at few or no advances in prices. The trend in market values, in fact, has been in a downward direction in most instances in recent weeks. This, from all indications, has been due principally to the limited demand emanating from mill quarters, papermakers not being in much need of additional supplies have held aloof as buyers, with the result prices have been accorded scant opportunity to improve their position even to a slight degree. As regards some raw materials used in the manufacture of paper and board, the present price situation does not seem to truly reflect the somewhat dangerous—potential, at any rate—supply condition, the factor of supply waging little or no influence when demand happens to be as restricted as now witnessed.

The call for rags from paper mills continues very slim, and price changes during the last several weeks have been virtually in every case in a lower course. At the same time dealers assert incoming supplies have fallen off appreciably —low prices having discouraged collections of old rags, and light production having curtailed supplies of new cuttings, while higher currency exchanges and advancing prices on foreign rags have reduced arrivals of imported material sharply. However, paper manufacturers are occasioned no difficulty in getting all the rags they need, and, under the prevailing narrow scope of demand, there would seem to be a surplus of most grades in the market although dealers insist not a great deal of buying would be necessary to clean up existing stocks and create an entirely different supply condition unless collections or production should meanwhile increase.

The fact that abnormally high foreign exchanges have practically shut off American importers in their quest of papermaking rags abroad at costs competitive with domestic rags is something for papermakers to ponder over. High, very high, prices are demanded by European shippers for rags; most of the quotations named are so far beyond a parity with market levels here that importers are making no effort at all to procure supplies in foreign quarters. As a matter of fact, the tables have been turned—European consumers in numerous cases are inquiring here for rag stock, and if the present exchange situation continues it is likely sizable shipments from this to the other side of the Atlantic will be recorded. This eventuality would prove altogether unfavorable for American paper mills.

Prices of many descriptions of new cotton cuttings have eased, at least to a moderate degree. No. 1 white shirt cuttings are reported available at 6.25 cents per pound f. o. b. dealers' shipping points, unbleached muslins at 6.75 cents, light silesias at 4.25 cents, blue overall cuttings at 4 cents, bleached shoe cuttings at 5.25 cents, bleached canton flannels at 5.50 cents, fancy shirt cuttings at 2.50 cents, and washables at 2.25 cents. New linen cuttings are relatively steady on quotable levels of around 10.50 cents a pound for white and 8.25 cents for grey linen at shipping points. Old white cottons are to be had at 2.50 to 2.75 cents per pound for No. 1 repacked, and 2 to 2.25 cents for No. 1 miscellaneous whites, while repacked thirds and blues are reported offered to paper mills at 1.25 cents and rough blues at 90 cents per hundred pounds f. o. b. dealers' points.

◆ Old Paper

The old paper market condition is simply a reflection of the poor board market. Board manufacturers, not being in need of usual amounts of waste paper, are absorbing supplies in small tonnage, and with demand light, stocks have accumulated until there is a surplus of some grades, and prices have continued to decline. High grades as well as the low qualities have sagged in value. No. 1 hard white shavings are reported selling in the East at 2.15 cents per pound f.o.b. New York, No. 1 soft white shavings at 1.90 cents, No. 1 hard white envelope cuttings at 2.40 cents, white ledgers at 1.20 cents, colored ledgers at a cent per pound, and No. 1 old kraft at 1.05 to 1.10 cents. Book stock has dropped sharply to a basis of 70 to 75 cents per hundred pounds New York for heavy No. 1 old magazines, and folded news is available at 40 cents per hundred, and No. 1 mixed paper at 25 cents. Prices a little above these on the low grades prevail in the Middle West where dealers seem to be having more success in sustaining the market.

◆ Chemical Pulp

The most salient feature in the domestic chemical pulp market is the noticeable unwillingness of producers to sell, more especially for any time far ahead. Most domestic manufacturers are well booked on orders, having their output practically sold up for a time, and in view of the strong price situation in foreign pulp and the likelihood that higher market levels will be witnessed, are satisfied to wait before entering further sales commitments. Moreover, firm prices in full relationship with ruling values of imported pulps are demanded. Domestic bleached sulphite of prime grade is reported scarcely unobtainable under a basis of 3 cents per pound ex dock Atlantic seaboard, while unbleached sulphite of book grade is around 2.10 cents per pound at pulp mills and news quality 1.90 cents. Bleached soda pulp is bringing 2.50 cents delivered book paper mills, and domestic kraft pulp is on a price range of 1.70 to 2 cents at pulp mills, according to quality and source.

◆ Rope and Bagging

The factor of advanced exchanges and resultant higher prices on foreign stock is commencing to have influence in the market for old rope and bagging. Dealers declare it is impossible for them to buy abroad at the prices quoted by European shippers and expect to dispose of the goods to paper mills here profitably at prices the latter are willing to meet. Current sales are therefore being filled almost entirely with domestic material. Consumer demand for old rope is very limited. Occasional purchases are reported, usually on a price basis of about 2.50 cents per pound f.o.b. shipping points for No. 1 domestic old manila rope.

◆ Chemicals

Quotations on bleaching powder have been advanced 15 cents per hundred pounds to a range of 1.90 to 2.10 cents a pound f.o.b. works for bleach in drums. Casein is in fair demand and prices steady at 12.50 to 13.50 cents per pound for domestic and 15.50 to 15.75 for the imported product, duty paid. Soda ash is slightly higher at 1.40 cents a pound for bag shipments at works, and solid caustic soda is quoted at 2.60 cents upwards, and sulphur at $18 to $21 a ton at mines.

◆ Pulpwood

Supplies of pulpwood are moving in a steady manner although demand is not so pronounced as it was a few weeks ago. Consumers are acquiring wood through regular channels, and seldom are going afield for additional lots. Prices are generally unchanged.

◆ Mechanical Pulp

Activity in the mechanical pulp market has simmered down to a decided degree. Apparently consuming mills have their needs provided for or else are not using normal tonnages, and consequently are keeping much out of evidence as buyers. Nevertheless a steady to firm tone characterizes prices, and, with Scandinavian groundwood climbing in price and Canadian pulp also tending upward, domestic producers are not pressing to sell and are bent on securing the full prices asked. Domestic and Canadian groundwood is selling at around $35 a ton delivered consuming centers, prices of course, being dependent on the haul from production points and also on the air dry test. Grinders across the Canadian border are said to be well sold up and in some instances behind in shipments, due to unfavorable water conditions or other hampering circumstances.

Import and Export MARKETS

IMPORTS

◆ Wood Pulp

Gyrations in foreign exchanges have created a most difficult situation in imported wood pulp; that is, from the angle of market prices. With sterling exchange rising to new heights and carrying along with it Scandinavian and other European currencies while the American dollar declined in terms of international value, producers of wood pulp abroad have not only shown distinct unwillingness to sell pulp in the United States but in a large majority of cases have ceased making offerings to this country, at least for the time being. The tendency in pulp market prices has been sharply upward, yet with few offerings of a firm character in the market and with American paper and board manufacturers evincing a lack of readiness to pay advances, the market is largely a nominal matter with no one seeming to know just what prices constitute market levels.

This much appears certain; namely, that minimum market rates have been established, under which it is practically impossible to buy foreign pulp. In fact, it is no easy task for buyers to get pulp at these minimum prices, for the reason few mills in Europe are selling and because little supply of pulp is available on the spot in the United States, even at prices above the bottom points of quotational ranges. Prime bleached sulphite is between 2.75 and 3 cents per pound ex dock American Atlantic ports, strong unbleached sulphite of prime quality 2.10 to 2.25 cents, and prime Swedish kraft pulp 1.85 cents upwards with up to 2 cents reported paid on spot lots.

As would be expected under prevailing circumstances, the market rules quiet. This, it would seem, is due not so much to the level of prices as to the great uncertainty existing and the resultant indisposition of sellers to sell and consumers to buy while money values are so upset and fraught with so much irregularity. Scandinavian producers are little disposed to make sales while obliged to accept very nearly the same prices they obtained several months ago in the face of a depreciation meanwhile in the value of the dollar of fully 20 per cent. On the other hand, American papermakers have not been in much need of additional supplies of pulp recently, their requirements having been reduced by a quieting of the market for paper and board, and since they bought foreign pulp on a large scale earlier in the year with large tonnage shipments coming in against commitments made during the summer.

Importations of wood pulp into the United States continue on a large scale. During September a total of 171,750 long tons of chemical pulp, valued at $6,035,752, was imported, according to official figures issued by the U. S. Department of Commerce, showing a slight decrease from the 173,787 tons of a value of $5,906,775 imported in the month before, but a big gain over the 70,351 tons of a value of $2,689,919 in September last year. Imports during the first nine months of the current year, aggregating 1,038,169 long tons of chemical of a declared value of $36,772,089, registered a large increase over the 790,938 tons of a value of $30,778,640 imported in the corresponding period of 1932. Judging from these import statistics, there is no shortage of foreign pulp in the United States, and there probably isn't, the likelihood being most paper and board mills have good stocks on hand.

Imports of groundwood in September amounted to 22,240 long tons, valued at $409,199, against 19,066 tons of a value of $344,432 in the preceding month and making a total for the first nine months of this year of 122,731 tons of a value of $2,126,045, contrasted with 114,170 tons of a value of $2,304,651 a year ago. Current quotations on Scandinavian groundwood are $30 upwards per short ton for dry and $28 for moist, ex dock American Atlantic seaboard.

◆ Paper

Imports of paper into the United States scored a gain in point of total value during September last over the preceding month, reaching $7,738,772 in value, against receipts valued at $6,541,721 in August last. Imports during the first nine months of this year were valued at $55,660,559, compared with $77,063,960 in the similar time of 1932, according to U. S. Department of Commerce figures. Standard newsprint, to the value of $49,534,668, comprised the principal import in the first nine months of the current year, while cigarette paper, valued at $2,255,037, was the second item of importance in paper imports during the same period.

◆ Paper Stock

Imports of papermaking rags into the United States totaled 31,641,577 pounds of a declared value of $247,444 in September last, an increase over the 29,435,573 pounds of a value of $245,629 in the preceding month and a big rise over the 4,225,980 pounds of a value of $63,617 in the same month last year, according to U. S. Department of Commerce statistics. The September receipts brought the total for the first nine months of this year up to 134,333,646 pounds, valued at $1,018,625, contrasted with 68,320,085 pounds of a value of $917,950 in the same period of 1932. Miscellaneous paper stock, including old rope, bagging, waste paper, etc., imported in September amounted to 10,825,861 pounds, valued at $131,156, compared with 13,626,511 pounds of a value of $157,753 in the month before, making a total for nine months this year of 79,321,139 pounds of a value of $802,426, against 68,977,449 pounds of a value of $610,900 in the corresponding time a year ago.

EXPORTS

Following a reaction downward in August, as compared with the preceding month, exports of paper and paper products from the United States went forward during September, from a total value standpoint. The value of paper exportations from this country in September was $1,242,956, compared with $1,152,788 in August and $1,118,852 in September, 1932, according to official figures compiled by the U. S. Department of Commerce. The September shipments brought the aggregate for the first nine months of this year up to a value of $10,200,612, against $12,024,460 in the similar period last year.

Exports of newsprint in September last amounted to 1,763,979 pounds of a value of $39,470, making a total of 14,482,997 pounds of a value of $291,763 during the first nine months of the current year. Shipments of uncoated book paper during the first nine months of this year were 13,347,623 pounds, valued at $619,475, while wrapping paper exports were 17,497,222 pounds of a value of $889,626, and writing paper exports were 9,307,344 pounds of a value of $604,522. Exports of tissue and crepe paper in the nine-month period amounted to 2,729,851 pounds, valued at $391,610; of sheathing and building paper, 4,861,536 pounds of a value of $117,007; of cover paper, 605,001 pounds of a value of $76,914; of toilet paper, 4,871,193 pounds of a value of $388,449, and of blotting paper, 1,187,890 pounds of a value of $107,631. Boxboard exports totaled 28,718,457 pounds of a value of $633,798, and other paperboard 13,043,873 pounds of a value of $452,593 in the first nine months of this year. Paper bag exports amounted to 8,292,657 pounds, valued at $407,835, and paper box and carton shipments were 5,390,022 pounds, valued at $330,334.

Exports of paper base stocks, comprising wood pulp, rags, etc., were valued at $2,511,404 in the first nine months of this year, against shipments of a value of $2,052,808 in the same period of 1932.

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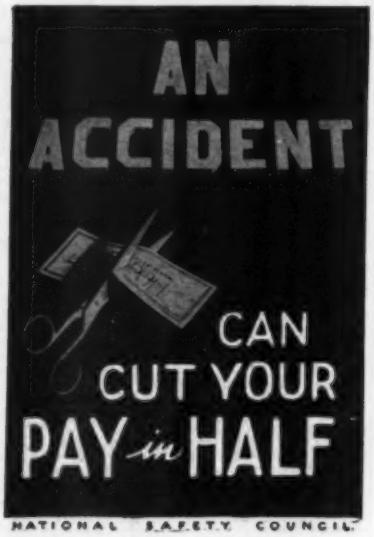

A Typical Poster

One of the Council's most popular posters (pictured in miniature above) is illustrative of the character of posters produced.

Through Systematic Use of

SAFETY POSTERS

VISIT the winning mills of The Paper Industry Safety Contest—the mills that operated with no accidents last year—and you will see vivid and effective safety posters displayed prominently upon bulletin boards. Frequently changed, these posters get safety across to the workers.

Are you using posters successfully? The National Safety Council produces 63 new and different posters every month that you can select from, so if you are not getting results from your bulletin boards, write the Council at once for samples and information. The National Safety Council wants to help you make 1934 a no-accident year.

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Fig. 124
Y Valve,
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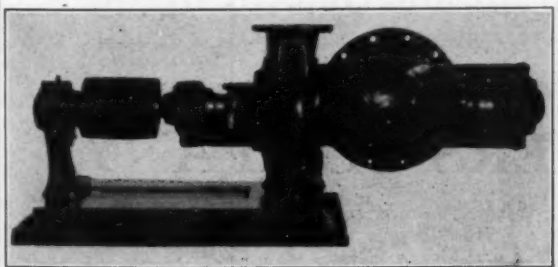

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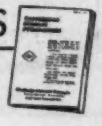

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